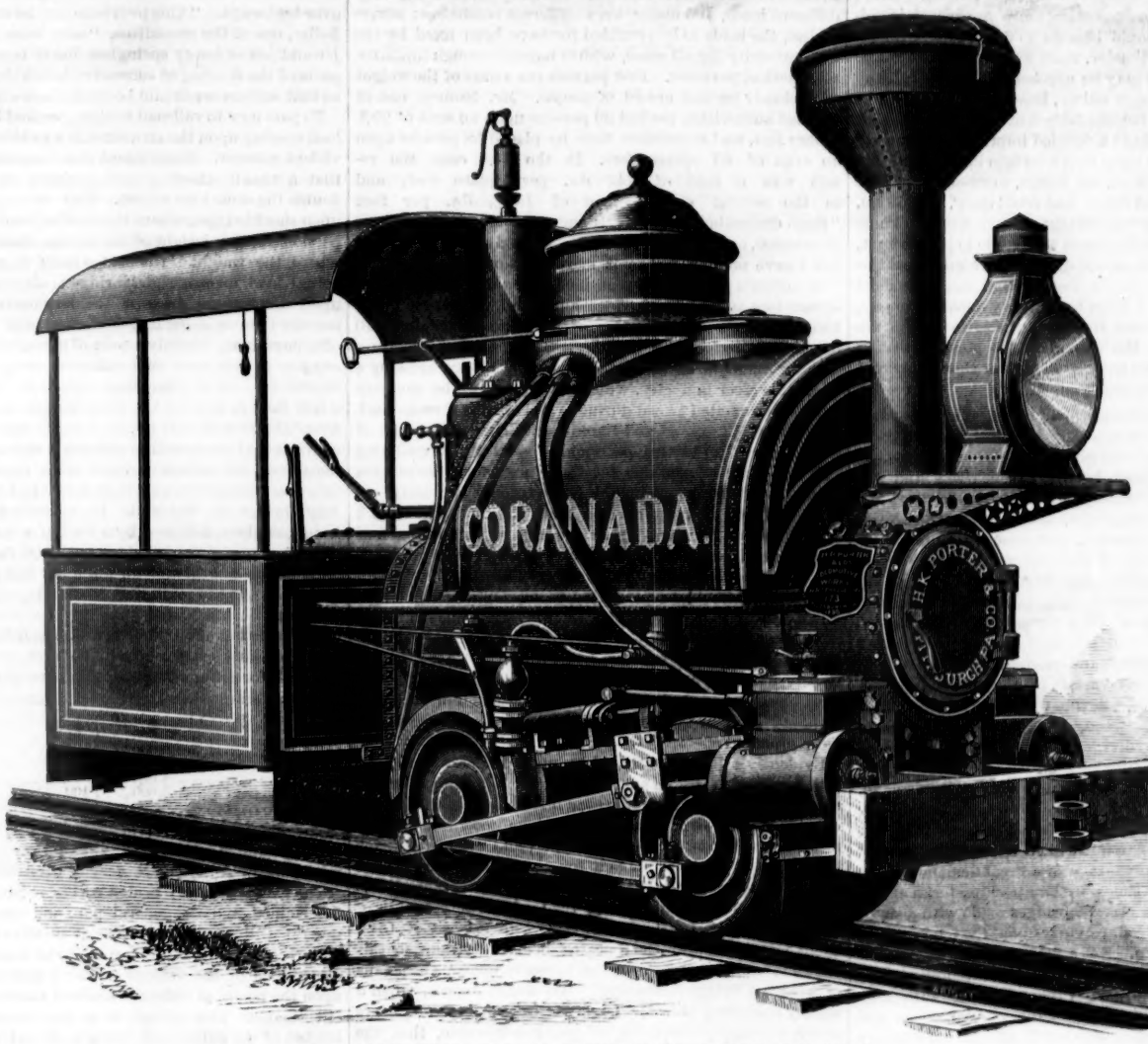
RAILROAD GAZETTE

FRIDAY, JUNE 25, 1880.

Locomotive for Twenty-Inches Gauge.

The following is a description of a locomotive built by H. K. Porter & Co., of Pittsburgh, Pa, of which we present an illustration:

Gauge of track, 20 inches.
Cylinders, 6 inches diameter, 10 inches stroke.
Wheel-base, 45 inches.
Diameter of boiler at smoke-box end, 23 inches.
Number of flues, 29, diameter 1¾ inches, length, 72 inches.
Fire-box, 28 inches long, 19 inches wide, 27⅞ inches deep, inside measurements.
Driving wheels, 22 inches diameter.



LOCOMOTIVE FOR TWENTY-INCHES GAUGE RAILROAD.

Built by H. K. Porter & Co., Pittsburgh, Pa.

Water supplied by one full-stroke pump and one number two injector.
Tank capacity, 200 gallons.
Fuel, wood; fuel room for about one-fourth of a cord of engine wood.
Weight in working order, about 9,000 pounds.
Extreme width over all, 65 inches at back bumper, 46 inches at cylinders.
Extreme height, 100 inches.
Extreme length, 158 inches.
Width in clear between frames, 13 inches.
Shifting link motion; steel links with steel thimbles and pins throughout the valve and reversing gear.
Throw of eccentrics, 2⅝ inches.

This locomotive was built for Freudenthal & Co., of New York, for the use of the Longfellow Mining Company, of Arizona. The railroad is 5½ miles long, with maximum grades of 4½ per 100 and minimum curves of 90 feet radius, with 16-lb. rails, and is used for the transportation of copper ore, the loaded cars coming down grade. The locomotive boiler is set on a slight incline, so that the water will be level when it is on an average grade, and the engine is intended to back up the grade. The locomotive was taken apart and boxed for shipment; it had to be prepared for hauling by wagons several hundred miles from the railroad terminus. The frames, with cylinders and entire link motion, all were placed in a box about 8×4×3 ft., and weighing about 2,000 lbs. H. K. Porter & Co. build still smaller locomotives, with 5×10-in. cylinders, weighing about 6,500 lbs., which are used for sugar plantations, tramways and other roads with very light rails.

—Hon. R. D. Rice, formerly a judge of the Maine Supreme Court, afterward President of the Maine Central Railroad Company, and for a time Vice-President of the Northern Pacific, is now violently insane, and it is feared that his case is incurable.

Contributions.

Bridge Disasters in America—The Cause and the Remedy.

BY PROF. GEO. L. VOSE.

A few years ago an iron highway bridge at Dixon, Ill., fell, while a crowd was upon it, and killed sixty persons. The briefest inspection of that bridge by any competent engineer would have been sure to condemn it. A few years later the Ashtabula bridge, upon the Lake Shore Railroad, broke down under a passenger train, and killed from 80 to 100 passengers. The report of the committee of the Ohio Legislature appointed to investigate that disaster concluded, first, that the bridge went down under an ordinary load by reason of defects in its original construction; and, secondly, that the defects in the original construction of the bridge could have been discovered at any time after its erection by careful examination. Hardly had the public recovered from the shock of this terrible disaster when the Tariffville calamity added its list of dead and wounded to the long roll already charged to the ignorance and recklessness which characterizes so much of the management of the public works in this country.

There are many bridges now in use upon our railroads in no way better than those at Ashtabula and Tariffville, and which await only the right combination of circumstances to tumble down. There are, by the laws of chance, just so many persons who are going to be killed on those bridges. There are hundreds of highway bridges now in daily use which are in no way safer than the bridge at Dixon was, and which would certainly be condemned by five minutes of competent and honest inspection. More than that, many of them have already been condemned, as unfit for public use, but yet they are allowed to remain, and invite the disaster which is sure to come. Can nothing be done to prevent this reckless and wicked waste of human life? Can we not have some system of public control of public works which shall secure the public safety? The answer to this question will be, not until the public is a good deal more enlightened upon these matters than it is now.

It has been very correctly remarked that in order to bring a disaster to the public notice it must be emphasized by loss of life. The Ashtabula bridge fell and killed over 80 persons, and a storm of indignation swept over the country from one end to the other. No language was severe enough to apply to the managers of the Lake Shore Railroad; but if that very bridge had fallen under a freight train, and no one had been injured, the occurrence would have been dismissed with a paragraph, if, indeed, it had received even that recognition. In February, 1879, a span 110 ft. long of an iron bridge on the Chicago & Alton Railroad, at Wilmington, Ill., fell as a train of empty coal cars was passing over it, and three cars were precipitated into the river, a distance of over 30 ft.. No one was injured. Not a word of comment was ever made in regard to this occurrence. Suppose that in place of empty coal cars the train had consisted of loaded passenger cars, and that 100 persons had been killed. We know very well what the result would have been. Is not the company just as much to blame in one case as in the other? On the night of the 9th of November last one span of the large bridge over the Missouri River, at St. Charles, upon the St. Louis, Kansas City & Northern Railway, gave way as a freight train was crossing it, and 17 loaded stock cars and the caboose fell, a distance of 80 ft., into the river. Two brakemen and two drovers, who were in the caboose, were killed. The bridge, says the only account that has appeared, did not break, apparently, for the whole span went down with the cars upon it It could hardly make much difference, we should suppose, to the four men who were killed, whether the bridge *broke* down or *went* down. This disaster occurred early last November, and not a word has appeared in the papers since in regard to it. Suppose that in place of 17 stock cars half-a-dozen passenger cars had fallen from a height of 80 ft. into the river, and that in place of killing two brakemen and two drovers two or three hundred passengers had been killed. Is not the general public just as concerned in one case as the other?

Suppose that a bridge now standing is exactly as unsafe as the Ashtabula bridge was the day before it fell. Would it be possible to awaken public attention enough to have it examined? Probably not. A short time since the writer endeavored to induce one of the leading dailies in Massachusetts to expose a wretchedly unsafe bridge in New England; but the editor declined on the ground that the matter was not of sufficient interest for his readers; but less than a month afterward he devoted three columns of his paper to a detailed account of a bridge disaster in Scotland, and asked why it was that such things must happen, and if there was no way of determining in advance whether a bridge was safe or not. This editor certainly would not maintain that, in itself, it was more important to describe a disaster after it had occurred, than to endeavor to prevent the occurrence; but, as a business man, he knew perfectly well that his patrons would read an account giving all of the sickening detail of a terrible catastrophe, while few, if any, would wade through a dry discussion of the means for protecting the public from just such disasters. The public is always very indignant with the effect, but does not care to trouble itself with the cause; but the effect never will be prevented until the cause is controlled, and the sooner the public understands that the cause is in its own hands, to be controlled or not, as it chooses, the sooner we shall have a

remedy for the fearful disasters which are altogether too common in the United States.

In a country where government controls all matters on which the public safety depends, and where no bridge over which the public is to pass is allowed to be built except after the plans have been approved by competent authority, where no work can be executed except under the rigid inspection of the best experts, nor opened to the public until it has been officially tested and accepted, it makes little or no difference whether the public is informed or not upon these matters; but in a country like the United States, where any man may at any time open a shop for the manufacture of bridges, whether he knows anything about the business or not, and is at liberty to use cheap and insufficient material, and where public officers are always to be found ready to buy such bridges simply because the first cost is low, and to place them in the public ways, it makes a good deal of difference. There is at present in this country absolutely no law, no control, no inspection, which can prevent the building and the use of unsafe bridges; and there never will be until the people who make the laws see the need of such control. There is no one thing more important in this matter than that we should be able to fix precisely the responsibility, in case of disaster, upon some person to whom the proper punishment may be applied. If every railway director, or town or county officer, knew that he was held personally accountable for the failure of any bridge in his charge, we should soon have a decided improvement in these structures. If we could show that a certain bridge in a large town had been for a long time, old, rotten, worn-out, and liable at any moment to tumble down, and could show, in addition, that the public officers having charge of such a bridge knew this to be the case, and still allowed the public to pass over it, we can see at once that in case of disaster the blame would be clearly located, and the action for damage would be short and decisive. Once let a town have heavy damages to pay, and let it know at the same time that the town officers are clearly accountable for the loss, and it is possible that it would be willing to adopt some system that should prevent the recurrence of such an outlay.

To see what may be accomplished by an efficient system of public inspection, it is necessary to know something in regard to the structures to be inspected. We have now, in common use in this country, both upon our roads and our railroads, bridges made entirely of iron, bridges of wood and iron combined, and occasionally, though not often now-a-days, a bridge entirely of wood; and these structures are to be seen of a great variety of patterns, of all sizes, and in every stage of preservation. American engineers have always excelled in this branch of their business, being unsurpassed by any other nation. Of late years, so great has been the demand for bridge work that this branch of engineering has become a trade by itself, and we find immense works, fitted up with an endless variety of the most admirably adapted machine tools, devoted exclusively to the making of bridges of wood, iron, steel, or all combined. As in all division of labor the resul of this specialization has been to improve vastly the quality of the product, to lessen the cost, and to increase the demand, until many of our large firms reckon the length of bridging which they have erected by miles instead of feet. As usual, however, in such cases, unprincipled adventurers are not wanting; who, taking advantage of a great demand, do not hesitate to fit up cheap shops, to buy poor material and to flood the market with a class of bridges made with a single object in view, viz., to sell, relying upon the ignorance of public officials for custom. Not a year passes in which some of these wretched traps do not tumble down, and cause a greater or less loss of life; and at the same time, with uninformed people, throw discredit on the whole modern system of bridge-building. This evil affects particularly highway bridges. The ordinary county commissioner or select-man considers himself amply competent to contract for a bridge of wood or iron, though he may never have given a single day of thought to the matter before his appointment to office. The result is that we see all over the country a great number of highway bridges which have been sold by dishonest builders to ignorant officials and which are on the eve of falling, and await only an extra large crowd of people, a company of soldiers, a procession, or something of the sort to break down.

After a defective bridge falls it is in nearly every case easy to see why it did so. It would be just about as easy to tell in advance that such a bridge would fall if it ever happened to be heavily loaded. Hundreds of highway bridges are today standing simply because they never happen to have received the load which is at any time liable to come upon them.

Not many years ago a new highway bridge of iron was to be made over a broad river in one of the largest towns in New England. The county commissioners desired a well-known engineer, especially noted as a bridge-builder, to superintend the work, in order to see that it was properly executed. The engineer, after inspection of the plans, told the commissioners plainly that the design was defective, and would not make a safe bridge; and that unless it was materally changed he would have nothing to do with it. The bridge, however, was a cheap one, and as such com mended itself to the commissioners, who proceeded to have it erected according to the original plan; and these same commissioners now point to that bridge, which has not yet fallen, but which is liable to do so at any time, as a complete vindication of their judgment, so called, as opposed to that of the engineer who had spent his life in building bridges.

An impression exists in the minds of many persons that an iron bridge is necessarily a strong bridge. This is a great mistake. There are good iron bridges and there are also very poor ones. A good iron bridge is the best bridge one can buy; but a poor iron bridge is the worst—much worse than a poor wooden one; for when an iron bridge falls it is apt to go all at once, but a wooden one shows signs of failure long before it actually gives way. Another fallacy which infests some persons is the notion that it is purely a matter of opinion whether a bridge is safe or not. In nine cases out of ten it is not at all a matter of opinion, but a matter of fact, and of arithmetic. The whole question always comes to this: Is the material in this bridge of good quality, is there enough of it, is it properly put together? With given dimensions, and knowing the load to be carried, it is a matter of the very simplest computation to fix the size of each member. We know what one square inch of iron will hold, and we also know total the number of pounds to be sustained; and it is no matter of opinion, but one of simple division, as to how many times one will go into the other.

But, it may be asked, can the precise load which is coming upon any structure be exactly fixed? Are not the circumstances under which bridges are loaded very different? Bridges in different localities are certainly subjected to very different loads, and under very different conditions; nevertheless, the loads to be provided for have been fixed by the best authority for all cases, within narrow enough limits for all practical purposes. Few persons are aware of the weight of a closely packed crowd of people. Mr. Stoney, one of the best authorities, packed 30 persons upon an area of $29\frac{4}{10}$ square feet, and at another time he placed 58 persons upon an area of 57 square feet. In the first case, the result was a load of 149 lbs. per square foot, and in the second case a load of $147\frac{4}{10}$ lbs. per foot "Such cramming," says Mr. Stoney, "could scarcely occur in practice, except in portions of a strongly excited crowd; but I have no doubt that it does occasionally so occur." "In my own practice," he continues, "I adopt 100 lbs. per square foot as the standard working load, distributed uniformly over the whole surface of a public bridge, and 140 lbs. per square foot for certain portions of the structure; such for example as the foot-paths of a bridge crossing a navigable river in a city, which are liable to be severely tried by an excited crowd during a boat-race, or some similar occasion." Tredgold and Rankine estimate the weight of a dense crowd at 120 lbs. per square foot. Mr. Brunel used 100 lbs. in his calculations for the Hungerford Suspension Bridge. Mr. Drewry, an old but excellent authority, observes "that any body of men marching in step at from 3 to $3\frac{1}{2}$ miles an hour will strain a bridge at least as much as double the same weight at rest;" and he adds: "In prudence not more than one-sixth the number of infantry that would fill a bridge should be permitted to march over it in step." Mr. Roebling says, in speaking of Niagara Falls Railroad Suspension Bridge: "In my opinion, a heavy train, running at a speed of twenty miles an hour, does less injury to the structure than is caused by twenty heavy cattle under full trot. Public processions, marching to the sound of music, or bodies of soldiers keeping regular step, will produce a still more injurious effect."

Evidently a difference should be made in determining the load for London Bridge and the load for a highway bridge upon a New England country road in a thinly settled district. A bridge that is strong enough is just as good and just as safe as one that is ten times stronger, and even better; for in a large bridge, if we make it too strong, we make it at the same time too heavy. The weight of the structure itself has to be sustained, and this part of the load is a perpetual drag on the material. In 1875, the American Society of Civil Engineers, in view of the repeated bridge disasters in this country, appointed a committee to report upon "The Means of Averting Bridge Accidents." We might expect, when a society composed of some hundreds of our best engineers selects an expert committee of half a dozen men, that the best authority would be pretty well represented, and such was eminently the case. It would be impossible to have combined a greater amount of acknowledged talent, both theoretical and practical, with a wider and more valuable experience, than this committee possessed. The first point taken up in the report is the determination of the loads for which both railroad and highway bridges should be proportioned. In regard to highway bridges, a majority of the committee reported that for such structures the standard loads should not be less than as shown in the following table:

Span.	Pounds per Square foot.—Class A.	Class B.	Class C.
60 ft. and less	100	100	70
60 to 100 ft	90	75	60
100 to 200 ft	75	60	50
200 to 400 ft	60	50	40

Class A includes city and suburban bridges, and those over large rivers where great concentration of weight is possible; Class B denotes highway bridges in manufacturing districts, having well ballasted roads; and Class C refers to ordinary country road bridges, where travel is less frequent and lighter. A minority of the committee modified the table above by putting all highway bridges into the first class, and by making the loads larger by a small amount. The whole committee agreed in making the load per square foot less as the span is greater, which is of course correct. It would seem eminently correct to make a difference between a bridge which carries the continuous and heavy traffic of a large city and one which is subjected only to the comparatively light and infrequent traffic of a country road. At the same time it should not be forgotten that in a large part of the United States a bridge may be loaded by ten, twenty or even thirty lbs. per square foot by snow and ice alone, and that the very bridges which from their location we should be apt to make the lightest are those which would be most likely to be neglected, and not relieved from a heavy accumulation of snow. In view of the above, and remembering that a moving load produces a much greater strain upon a bridge than one which is at rest, we may be sure that, as the committee above referred to recommend, the loads should not be less than those given in the table. We can easily see that in special cases they should be more.

There is another point in regard to the loading of a highway bridge which is to be considered. It often happens that a very heavy load is carried over such bridges upon a single truck, thus throwing a heavy and concentrated load upon each point as it passes. Mr. Stoney states that a wagon with a crank shaft of the British ship Hercules, weighing about 45 tons, was refused a passage over Westminster iron bridge, for fear of damage to the structure, and had to be carried over the Waterloo Bridge, which was of stone, and he says that in many cases large boilers, heavy forgings or castings, reach as high as 12 tons upon a single wheel. The report of the American Society of Engineers, above referred to, advises that the floor system be strong enough to carry the following loads upon four wheels: on Class A, 24 tons; Class B, 16 tons, and Class C, 8 tons; though it is stated that these do not include the extraordinary loads sometimes taken over highways. "This provision for local loads," says Mr. Boller, one of the committee, "may seem extreme, but the jar and jolt of heavy springless loads comes directly on all parts of the flooring at successive intervals, and admonishes us that any errors should be on the safe side."

To pass now to railroad bridges, we find here a very heavy load coming upon the structure in a sudden and often very violent manner. Experiment and observation both indicate that a rapidly-moving load produces an effect equal to double the same load at rest. This effect is seen much more upon short bridges, where the moving load is large in proportion to the weight of the bridge, than upon long spans, where the weight of the bridge itself is considerable. The actual load upon a short bridge is also more per foot than upon a long one, because the locomotive, which is much heavier than an equal length of cars, may cover the whole of a short span, but only a part of a longer one. The largest engines in use upon our railroads weigh from 75,000 to 80,000 lbs. on a wheel-base not over 12 ft. in length, or 2,800 lbs. per foot for the whole length of the engine, and from 20,000 to 24,000 lbs. on a single pair of wheels. The heaviest coal trains will sometimes weigh nearly a ton per lineal foot, the ordinary freight trains from 1,600 to 1,800 lbs., and passenger trains from 1,000 to 1,200 lbs. per foot. Any bridge is liable to be traversed by two heavy freight engines, followed by a load of a ton to the foot, so that if we proportion a bridge for 3,000 lbs. per foot, for the total engine length, and for a ton per foot for the rest of the bridge, bearing in mind that 80,000 lbs. may come upon any 12 ft. of the track, and that any one point may be called upon to sustain 24,000 lbs., and regarding the increase of strain on short spans due to high speeds, we have the following loads for different spans, exclusive of the weight of the bridge:

Span.	Lbs. per foot.	Span.	Lbs. per foot.
12	7,000	50	3,000
15	6,000	100	2,800
20	4,800	200	2,600
25	4,000	300	2,500
30	3,600	400	2,450
40	3,200	500	2,400

The above does not vary essentially from the English practice, and is substantially the same as given by the Committee of the American Society of Civil Engineers.

The load which any bridge will be required to carry being determined, and the general plan and dimensions fixed, the several strains upon the different members follow by a simple process of arithmetic, leaving to be determined the actual dimensions of the various parts; a matter which depends upon the power of different kinds of material to resist different strains. This brings us to the exceedingly important subject of the nature and strength of materials.

It has been said that we know what one square inch of iron will hold. Like the question of loads, above examined, this is a matter which has been settled, at any rate within very narrow limits, by the experience of years of both European and American engineers. A bar of the best wrought-iron, one inch square, will not break under a tensile strain of less than 60,000 lbs. Only a small part of this, however, is to be used in practice. A bar or beam may be loaded with a greater weight, applied as a permanent or dead load, than would be safe as a moving or rolling weight. A load may be brought upon any material in an easy and gradual manner so as not to damage it, while the same load could not be suddenly and violently applied without injury. The margin for safety should be greater with a material liable to contain hidden defects than with one which is not so; and it should be greater for any member of a bridge which is subjected to several different kinds of strain than for one which has to resist only a single form of strain. Respect also should be had to the frequency with which any part is subjected to strain from a moving load, as this will manifestly influence its power of endurance. The rule in structures having so important an office to perform as railroad or highway bridges, should be, in all cases, absolute safety under all conditions.

The British Board of Trade fixes the greatest strain that shall come upon the material in a wrought-iron bridge, from the combined weight of the bridge and load, at 5 tons per square inch of the net section of the metal. The French practice allows $3\frac{4}{10}$ tons per square inch of the gross section of the metal, which, considering the amount taken out by rivet holes, is substantially the same as the English allowance. The report of the American Society above referred to recommends 10,000 lbs. per inch as the maximum for wrought-iron in tension in railroad bridges. For highway bridges, which are not subjected to such severe treatment, a unit strain of 15,000 lbs. per square inch is often allowed.

A very common clause in a specification is that *The Factor of Safety* shall be four, five or six, as the case may be, meaning by this that the actual load shall not exceed one-fourth, one-fifth, or one-sixth part of the breaking load. It is a little unfortunate that this term, "factor of safety," has found its way into use just as it has, for it by no means indicates what is intended, or what it is supposed to. The true margin for safety is not the difference between the working strain and the breaking strain, but between the working strain and that strain which will in any way unfit the material for use. Now any material is unfitted for use when it is so far distorted by overstraining that it cannot recover, or, technically speaking, when its elastic limit has been exceeded. The elastic limit of the best grades of iron is just about one-half the breaking weight, or from 25,000 to 30,000 lbs. per square inch; so that the working strain of 10,000 lbs. per inch gives a factor of safety of two and a half or three, instead of six. If the ratio between the elastic limit and the breaking weight, *i. e.*, if the *quality* of the iron was always the same, it might make no great difference how we used our factor; but some iron is hard and brittle, while other iron is soft and ductile. A high breaking strength may be due to the toughness of the iron, or to the hardness of the iron. A soft and ductile iron will stretch more or less before breaking, while a hard iron will often snap short off without warning, and at the same time both may have the same breaking strength. A tough and ductile iron should bend double when cold without showing any signs of fracture, and should stretch 15 per cent. of its length before breaking; but much of the iron used in bridges, although it may hold 50,000 lbs. per inch before failing, will not bend over 90 degrees without cracking, and has an elastic limit as low as 18,000 lbs. It is thus full as important to specify that an iron should have a high elastic limit, as that it should have a high breaking weight. A specification therefore which allowed no material to be strained by more than 10,000 lbs. per inch, and no iron to be used with a less elastic limit than 25,000 lbs., would at the same time agree with the standard requirement both in England and in the United States, and would also secure a good quality of iron.

The writer has before him two documents which illustrate the preceding remarks. The first is the account of the tests of the iron which came from the Tariffville bridge after its failure, and the second is the specification for the bridges upon the Cincinnati Southern Railway. The Tariffville bridge, though nominally a wooden one, like most structures of the kind relied entirely upon iron rods to keep the woodwork together. Though the rods were too small, and seriously defective in manufacture, the bridge ought not to have fallen from that cause. The ultimate strength of the iron was not what it should have been, but yet it was not low enough to explain the disaster; but when we look at the *quality* of the iron we have the cause of the fall. The rods taken from the bridge show an ultimate tensile strength per square inch of 47,560 lbs., but an elastic limit of only 19,000 lbs., while the strain which was at any time liable to come upon them was 22,000 lbs. per square inch, or 3,000 lbs. more than the elastic limit. The fracture of the tested rods, which it is stated broke with a single blow of the hammer very much in the manner of cast-iron, show a very inferior quality of material. The rods broke in the bridge exactly where we should look for the failure, viz. in the screw, at the end. No ordinary inspection would have detected this weakness. No inspection did detect it; but a proper specification, faithfully carried out, would have prevented the disaster.

Look now at an extract from the specification for bridges upon the Cincinnati Southern Railway:

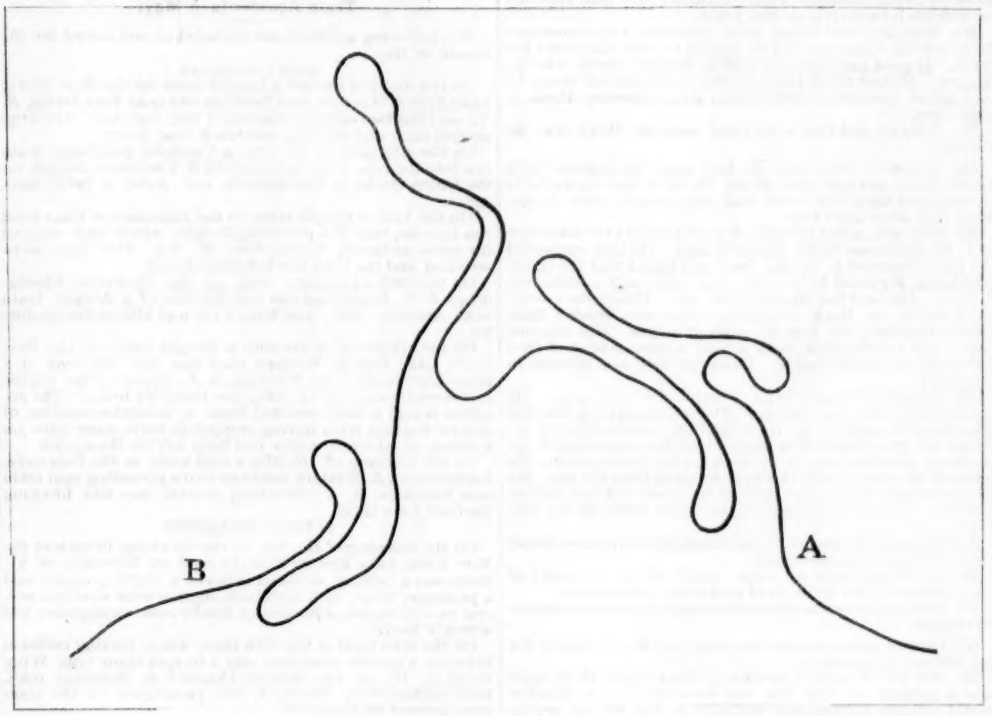
"All parts of the bridges and trestle-works must be proportioned to sustain the passage of the following rolling load, at a speed of not less than 30 miles an hour, viz.: two locomotives, coupled, each weighing 36 tons on the drivers in a space of 12 feet, the total weight of each engine and tender loaded being 66 tons in a space of 50 feet, and followed by loaded cars weighing 20 tons each in a space of 22 feet. An addition of 25 per cent. will be made to the strains produced by the rolling load considered as static, in all parts which are liable to be thrown suddenly under strain by the passage of a rapidly moving load. A similar addition of 50 per cent. will be made to the strain on suspension links and riveted connections of stringers with floor-beams, and floor-beams with trusses. The iron-work shall be so proportioned that the weight of the structure, together with the above specified rolling load, shall in no part cause a tensile strain of more than 10,000 lbs. per square inch of sectional area. Iron, used under tensile strain, shall be tough, ductile, of uniform quality, and capable of sustaining not less than 50,000 lbs. per square inch of sectional area without fracture, and 25,000 lbs. per square inch without taking a permanent set. The reduction of area at the breaking point shall average 25 per cent., and the elongation 15 per cent. When cold, the iron must bend, without sign of fracture, from 90 to 180 degrees."

A specification like the above, properly carried out, would put an absolute stop to the building of such structures as the Tariffville bridge, and would prevent a very large part of the catastrophies which so often shock the community, and shake the public faith in iron bridges. We have referred above to the factors of safety for wrought-iron under tension only. Similar factors have been determined for other kinds of materials, and for other kinds of strain.

The preceding remarks in regard to the loads for which bridges should be designed, and the safe weight to be put upon the material, are given to show how far the safety of a given bridge is a matter of fact, and how far a matter of opinion. It will be seen that the limits within which we are at liberty to vary are quite narrow; so that bridge-building may correctly be called an exact science, and there is no excuse for the person who guesses either at the load which a bridge should be designed to bear or at the size of the different members of the structure. Still less can we excuse the man who not only guesses, but who, in order to build cheaply, persistently guess on the wrong side.

We often hear it argued that a bridge must be safe since it has been submitted to a heavy load and did not break down. Such a test means absolutely nothing. It does not even show that the bridge will bear the same load again; much less does it show that it has the proper margin for safety. It simply shows that it did not break down at that time. Every rotten, worn-out and defective bridge that ever fell has been submitted to exactly that test. More than this, it has repeatedly happened that a heavy train has passed over a bridge in apparent safety, while a much lighter one passing directly afterward has gone directly through. In all such cases the structure has been weak and defective, and finally some heavy load passes over and cripples the bridge, so that the next load produces a disaster.

It is very common upon the completion of a bridge to do what is termed testing it. The common practice in England is to load each track with as many engines and tenders as the bridge will hold, and to measure the corresponding deflection. The proof-load varies from one and a half tons per foot on the shorter bridges to one ton per foot upon longer ones; but when the span exceeds 150 ft. in length the load is made somewhat less. In France, the government rules for testing wrought-iron railway bridges are as follows: Bridges under 66 ft. span are loaded with a dead load of one and a half tons per running foot, while bridges over 66 ft. span are loaded with $1\frac{2}{10}$ tons per foot. Besides the above proof, by dead weight, a train composed of two engines, each with its tender weighing at least 60 tons, and wagons each loaded with 12 tons, in sufficient number to cover one span, are run



over the bridge at speeds from 12 to 22 miles an hour. A second trial is made with speeds from 25 to 43 miles an hour, with two engines, each with its tender weighing 35 tons, and wagons as in ordinary passenger trains, enough to cover one span. On double-track bridges two trains are made to cross, at first in parallel and then in opposite directions, so that the trains may meet at the centre.

Owing to the lack of any public supervision in the United States, no general method for testing either railroad or highway bridges exists. In some cases it is done, in some cases it is not. Bridges made by our first-class firms, under the direction of engineers, are tested in substantially the same manner as in Europe; but upon many of our smaller railroads, which cannot afford to keep an engineer, and generally in the case of highway bridges, no test is made in many instances for very obvious reasons. In one case of wretchedly cheap and unsafe highway bridge which came recently under the writer's notice, the county commissioners, in order to quiet an impression which had arisen that the bridge was not altogether sound, tested a span 122 ft. long with a load *estimated* to weigh 58,600 lbs., or 480 lbs. per running foot, for a double roadway. The commissioners remarked that they considered this a satisfactory test, as it was not propable that a greater weight than this would ever be applied to the bridge; and added that the test was made merely to satisfy the public that the bridge was abundantly safe for all practical uses. The public would, no doubt, have been satisfied that the Ashtabula bridge was abundantly safe for all practical uses had it stood on that bridge in the morning and seen a heavy freight train go over it; and yet that very bridge broke down directly afterward under a passenger train. Now, according to the common notion that was a good bridge in the morning, and a very bad bridge, or rather no bridge at all, in the evening. The question for the public is—When did it cease to be a good bridge and begin to be a bad one? A test like the one referred to above can do no more than illustrate the ignorance or lack of honesty of those who make it, or those who are satisfied with it. Such a test might come within a dozen pounds of breaking the bridge down and no one would be the wiser.

For the test of a bridge to be in any way satisfactory, we must know just what effect such test has had upon the structure. We do not find this out by simply standing near and noting that the bridge did not break down. We must, in the first place, compute the strains which the load throws upon each part of the bridge, and see that no member is over-strained. We must next measure precisely the amount by which the bridge is depressed under the load, and also how far the work recovers from such depression when the load is removed. A locomotive, when first run on to a bridge, will produce a certain depression—first, by the closing up and stretching of the joints, and secondly by the elongation and compression of the material. If the load is left on for a considerable time the depression will be seen to have slightly increased; but after a longer time it will cease, the bridge having adapted itself to the new conditions impressed upon it. When the load is removed, the work will recover its first position, less a small amount, termed the permanent *set*. So long as the load is kept within the proper limits this permanent set is not increased by any number of subsequent applications of the force that produced it, and no harm is done; but when the load is so great that each application of the force increases the set, we have passed the elastic limit, and failure is only a question of time. It is important therefore to put the load on a second time, and to be sure that the bridge does not go below the point reached at first. In some cases a second application of the load has appeared to increase the permanent depression; but it is quite likely that in such instances the time during which the load was applied at first was too short for the full effect to show itself. Ample time, too, should be allowed for the material to recover after the removal of the load. Mr. Stoney states that the set of wrought-iron relaxes to a considerable extent, even after the lapse of several days after the load has been removed.

(TO BE CONTINUED.)

Railroad Locations.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The interesting sketch of the location of the Southern Pacific Railroad through the Tehachapi Pass, given by Mr. Day in your paper of May 28th, induces me to send you the inclosed sketch of a location which was made in 1865 over the Lukmanier Pass, between the head waters of the Rhine and those of the Ticino, some fifteen or twenty miles east of the St. Gothard Pass. This route was intended to connect Switzerland and Italy; but the completion of the St. Gothard Tunnel prevented its construction. The distance from it to B., ascending on the located line, is about 29½ miles, while the direct distance between the same points is only five miles; the development thus increasing the length nearly six times. The least radius of curvature is 984 ft., and the steepest grade 132 ft. per mile. I take this sketch from a set of engraved sheets which were sent me by Prof. A. Von Kaven, Director of the Polytechnic School at Aix la Chapelle, and which are intended to illustrate the subject of railroad location.

GEORGE L. VOSE.

MASTER MECHANICS' ASSOCIATION.

Thirteenth Annual Convention.

We continue this week our abstract from the official report of the proceedings of the convention at Cleveland.

SECOND DAY'S PROCEEDINGS.

At the opening of the proceedings:

Mr. JOHANN read a paper on wagon-top and straight-top boilers (already published, page 300).

On motion, the paper was ordered to be published in the proceedings as part of the report of the Committee on Boiler

Construction. Discussion on the report was then taken up.

Mr. JOHANN referred to the matter of fastening stay-bolts, whether it was better to rivet them, or to use nuts. He had come to the conclusion, as far as his investigations had gone, that it was better to rivet them, being careful, of course, to use good material. When nuts were used, leakage would sometimes start. He had found that boilers badly incrusted and filled with sediment would sometimes do their work pretty well, and this had set him to thinking that they might be able to get along with less heating surface.

Mr. SIMONDS said that his experience was that they had been putting in two many flues. He had built a good many engines, and had found very good results from decreasing the number of flues and giving more water space. He asked some questions as to Mr. Johann's tests of the wagon-top and straight-top boilers.

Mr. JOHANN said he had built the two boilers for the purpose of testing them under the same conditions as nearly as possible, that is, as to flues and heating surface. He had thought for some years that they had been looking for more heating surface than was really necessary. He had found boilers full of sediment clear up to the top of the crown-bars that were really doing pretty good work, and that set him to thinking whether it would not be better to have less heating surface and better circulation of water. This was one reason why he made his experiments. In one boiler he put in 160 flues, with ⅝-in. spaces between, and in the other the flues were spaced to give ⅞ in. clear between them. (He then read an article from the *Railroad Gazette* on this matter.) He had found that there was no difficulty in making steam where there was plenty of water. The only thing that could be said against it was that it would take more time and fuel to fire up. He had not got through with his experiments yet, and would be glad of any further light.

Mr. SEDGLEY agreed that too much attention had been given to heating surface. Less heating surface, more water and better circulation were needed.

Mr. STEEL said that on the Louisville & Nashville the experiment had been tried of riveting the crown-bolts instead of using nuts, but in the first engine the bolts soon gave out.

Mr. JOHANN said that further light was needed on this matter. He had never used nuts on stay-bolts. In the answers to the circulars of the committee they had received no definite information on this point.

Mr. SETCHEL had found that stay-bolts were sometimes broken while being screwed in, simply because they were too large. If good material was used he thought there was no danger. He had never had any stay-bolts pull out since he had given particular instructions about screwing them in with care.

Mr. JOHANN said that with good material there was no trouble.

Mr. BARRETT said that he had some 80 engines with crown-bolts screwed, and about 90 with the crown-bolts riveted, and they had never had any trouble with them. They had never used nuts.

Mr. SETCHEL asked whether it would make any difference as to the thickness of the material used. He had examined the boiler referred to by Mr. Steel and found that the sheet, which was supposed to be ¼ in., was really only a little over 3-16 in. The bolt had drawn right out. Unless the crown-sheet was ⅝ in. thick, something more was needed than merely clinching the bolt to make it secure. His practice was to use a crown-bolt with a good square head and then put in the nut on the inside. He never had any trouble in this way.

Mr. JOHANN thought ¼ in. too thin for the sheet. He thought that last year the committee recommended that the side-sheets be made ⅜ in. thick, and the crown-sheets ⅝ in. He set his crown-bolts 3 in. apart, and his crown-bars 2 in. He never used less than ⅝ in. thick for his crown-sheets. He screwed his crown-bolts through the sheet from the top. He has been using the present method six years and had had no trouble. The screw-threads on his bolts were cut by machine.

At this point the report of the Committee on Amendment of the By-Laws was presented.

Mr. RAYMOND spoke at some length of the necessity of some change in the methods of gathering information.

Mr. SPRAGUE thought that time should be taken to consider the report.

Mr. ORTTON spoke against imposing any fine or penalty for not answering questions.

Mr. JOHANN thought some change was needed. He thought that a penalty or fine was not advisable. If a member would not give information willingly, it was no use trying to force it out.

Mr. SPRAGUE thought there were cases where it would not be right to try to compel members to give infomation.

Mr. RAYMOND thought it would be better to have the Convention sit four days instead of three, giving more time. The committees had to lay out the work, and they should meet and discuss matters while the Convention was still sitting, so as to decide what they would do and how much work they would do.

Mr. SPRAGUE was willing to see the plan tried, though he believed there were grave objections to it.

Mr. SETCHEL objected that the committees, under the proposed plan, were to call upon only a few of the members for advice.

Mr. RAYMOND said that the questions would be sent to only a few members. If they refused to answer, it would be well to publish their names in the annual report as a sort of reprimand.

After some further discussion, this report was made a special order for 12 o'clock, and the discussion on boilers taken up again.

Mr. SETCHEL said that there was a general disposition to reduce the thickness of sheets as much as possible. He believed that they would stand service as well as the thicker sheets where there was hard water. He had some heavy mogul engines with ¼-in. sheets in the fire-boxes. Where coal was burned, it was well to have the sheets as thin as possible.

Mr. HAYES agreed that it was well to have the sheets as thin as possible. But with a thin sheet, when there was much deposit in the boiler, the crown-sheets were liable to come down unless nuts were used.

Mr. WOODCOCK was using arched crown-sheets, but had had some trouble from their cracking.

On motion the discussion was closed.

The next thing in order was the report on performance of engines. On motion, this was closed without further discussion.

The next in order was discussion on the report on prevention of smoke. On motion, this report was again read.

Mr. JOHANN thought that the best method of preventing smoke was careful training of the engineer and fireman. Careful firing would do more than any machine that could be put on a locomotive.

Mr. HAYES thought there was room for further consideration, and that the subject had better go to the committee for another year.

Mr. ORTTON had seen many contrivances tried, but believed that there was nothing like careful firing. He believed in large fire-boxes, and in teaching the firemen to put in coal carefully and in small quantities. In England much more care was used in this matter, and they took great pains to keep an even fire, and there was very little trouble from smoke. A careful inspection was kept up, and engineers were fined if their engines allowed too much smoke or sparks to escape. The cases, however, were very rare where engines were reported.

Mr. STEEL said that they had tried many plans, and he believed the committee had arrived at the true conclusion, that large fire-boxes and careful firing were the best preventives of smoke.

The discussion was then closed and a short recess taken.

After recess the resolutions providing for a Standing Committee were taken up and passed, as noted in our previous report.

The time for the discussion of questions having arrived, the following was read:

"What is the best method of staying crown-sheets, with crown-bars or stay-bolts?"

Mr. Forney, who proposed this question, being absent, it was laid aside.

The next question was: "Are sling-stays from the crown-bars to the outside shell of the boiler necessary to hold the crown and make the boiler safe?"

Mr. SEDGLEY said he has never been able to run a boiler without sling-stays. Where he used them he had never had a crown-sheet come down.

Mr. LILLY said that it had been his practice to use them when he had boilers under his charge. In some cases stay-bolts were run across, resting on the side-sheets, and the crown-sheets were stayed from these.

Mr. FORNEY said that it had been asserted that several explosions could be traced to the absence of sling-stays. Some master mechanics and some locomotive builders contended that they were not necessary. In looking over the English Board of Trade reports he had found that most of the explosions reported were traced to the absence of sling-stays. There was a great deal of discussion in regard to this question. If sling-stays were used it was necessary to fasten them to the outside shell in such a way as not to weaken it. Mr. Forney proceeded to explain several ways of staying the crown-sheet, illustrating his remarks on the blackboard.

The discussion was then closed, the hour having passed.

Train Accidents in May.

The following accidents are included in our record for the month of May:

REAR COLLISIONS.

On the night of the 5th a freight-train on the New York, Lake Erie & Western road broke in two near Port Jervis, N. Y., and the two sections afterward ran together, wrecking several cars, and blocking one track four hours.

On the afternoon of the 14th, a Vandalia passenger train ran into the rear of an Indianapolis & Vincennes freight on the Union tracks in Indianapolis, Ind., doing a little damage.

On the 17th a freight train on the Baltimore & Ohio road ran into the rear of a preceding freight which had stopped for water at Green Spring Run, W. Va. Five cars were wrecked and the road blocked three hours.

On the 25th a passenger train on the Nashville, Chattanooga & St. Louis road ran into the rear of a freight train near Antioch, Ala., wrecking a car and killing the conductor.

On the afternoon of the 25th a freight train on the New York, Lake Erie & Western road ran into the rear of a preceding freight near Mahwah, N. J., wrecking the engine and several cars, and blocking one track six hours. The accident is said to have resulted from a misunderstanding of orders, the first train having stopped to leave some cars on a siding, of which no notice had been left for the second.

On the morning of the 31st a coal train on the Delaware, Lackawanna & Western road ran into a preceding coal train near Stanhope, N. J., wrecking several cars and blocking the road for a time.

BUTTING COLLISIONS.

On the morning of the 8th, on the Newburg Branch of the New York, Lake Erie & Western road, in Newburg, N. Y., there was a butting collision between a shifting engine and a passenger train, by which both engines were wrecked, several cars damaged, a brakeman fatally and an engineer less severely hurt.

On the afternoon of the 12th there was a butting collision between a special passenger and a freight train near Wing Road, N. H., on the Boston, Concord & Montreal road. Both engines were damaged; two passengers on the train were injured by the shock.

On the night of the 25th a freight train on the Toledo, Peoria & Warsaw road broke in two near Seville, Ill., and the rear section ran back down a grade and into the head of a following freight. Several cars were wrecked and six men in the caboose were hurt, one of them badly.

On the afternoon of the 27th there was a butting collision between a passenger and a freight train on the Wilmington & Northern road near Naomi, Pa. Both engines were thrown over and badly broken; a number of freight cars were piled up in a bad wreck; every car of the passenger train was damaged, and 12 persons were hurt, several of them very badly. The freight train was behind time, but hoped to reach Naomi siding before it met the passenger train.

Very early on the morning of the 28th a freight train on the Chicago, Pekin & Southwestern road broke in two on a grade near Peoria, Ill., and the detached cars ran back down the grade and into a following train, wrecking several cars.

DERAILMENT, BROKEN WHEEL.

On the morning of the 4th several cars of a freight train on the Boston & Albany road were thrown from the track at Chester, Mass., by the breaking of a wheel, blocking the road several hours.

DERAILMENTS, BROKEN AXLE.

On the evening of the 3d the engine of a local passenger train on the New York Central & Hudson River road broke a driving axle at Schuyler Crossing, near Frankfort, N. Y. The engine was thrown over down a bank, and the baggage car was pulled from the track. The engineer, fireman, baggage-man and a passenger were slightly hurt.

Very early on the morning of the 12th six cars of a freight train on the Pennsylvania Railroad were thrown from the track near Johnstown, Pa., by a broken axle. Four of them were badly wrecked, blocking one track several hours.

On the morning of the 13th an axle broke under a car in a freight train on the Pennsylvania Railroad, near Conemaugh Furnace, Pa., and five cars were thrown from the track, three of them going down a bank into the Conemaugh River.

On the afternoon of the 19th an axle broke under a car in a coal train on the Central Railroad of New Jersey, near Fanwood, N. J., and some 20 cars were thrown from the track and piled up in a bad wreck, blocking both tracks for several hours. The axle gave way in the journals, it is said because of heating.

DERAILMENT, BROKEN DRAW-BAR.

About noon on the 11th a draw-head broke in a freight train on the New York Central & Hudson River road near Frankfort, N. Y. The car was thrown from the track and nine others followed it and were piled up in a bad wreck that took over three hours to clear away.

DERAILMENT, BROKEN SWITCH-ROD.

On the morning of the 24th a passenger train on the Cleveland, Columbus, Cincinnati & Indianapolis road was thrown from the track at Wellington, O., by the breaking of a switch-rod. The baggage car upset and was damaged.

DERAILMENT, BROKEN BRIDGE.

On the morning of the 10th a bridge on the Chicago Branch of the Wabash, St. Louis & Pacific road near Streator, Ill., the abutments of which had been undermined by a freshet, gave way under a passenger train, and the engine and baggage car went down into the creek. Three train-men were hurt.

DERAILMENT, SPREADING OF RAILS.

On the morning of the 7th four cars of a ballast train on the New Jersey Southern road were thrown from the track near Shark River, N. J., by the spreading of the rails. The cars went down a bank and were badly broken, injuring five laborers.

On the afternoon of the 22d the engine of a construction train on the Cincinnati, Effingham & Quincy road was thrown from the track near Sullivan, Ind., by the spreading of the rails. The track had been laid but a few days.

DERAILMENTS, WASH-OUT.

Very early on the morning of the 9th an express train on the St. Louis, Iron Mountain & Southern road ran into a wash-out near Bismarck, Mo. The engine went into the gap and was wrecked; the baggage car and one passenger car ran off and upset, the rest of the train remaining on the track. The engineer and fireman were killed; three passengers and a tramp, who was stealing a ride, were hurt.

Late on the night of the 21st the night passenger train on the Southwestern Railroad, of Georgia, ran into a wash-out at Shatulga Creek, near Geneva, Ga. The engine went down into the gap with several express freight cars on top of it in a bad wreck. The engineer, fireman, wood-passer and another man on the engine were killed and a brakeman was badly hurt. It was very dark and raining hard at the time of the accident.

Very early on the morning of the 22d a passenger train on the Chicago & Grand Trunk road ran into a wash-out near Bellevue, Mich. The engine and three cars were thrown from the track and badly damaged, and the engineer was slightly hurt.

DERAILMENT, CATTLE.

On the 24th a material train on the Atlantic, Mississippi & Ohio road ran over a cow, near Petersburg Va., throwing the train off the track and down a bank, wrecking several cars, killing two train-men and injuring two others.

DERAILMENTS, MISPLACED SWITCH.

On the morning of the 4th the engine and ten cars of an ore train were thrown from the track on the Chicago & Northwestern ore-dock at Escanaba, Mich., by a misplaced switch.

On the afternoon of the 5th a passenger train on the Vandalia Line was thrown from the track by a misplaced switch in Indianapolis, Ind., causing some delay.

On the afternoon of the 10th an express train on the New York Central & Hudson River road ran upon an open cross-over switch near St. Johnsville, N. Y. The train passed over until it reached the outer end of the switch, which was locked open, and then left the track. The engine was thrown around and fell over on its side; the baggage car and mail car were piled up together and completely wrecked; one sleeping car was thrown over on its side with the rest crowded up against it. The engineer, a brakeman, two posta clerks and a passenger were hurt.

On the morning of the 19th a New Jersey & New York passenger train was thrown from the track on the New York, Lake Erie & Western track near Secaucus, N. J., by a misplaced switch. The engine and baggage car were upset and badly broken, injuring the fireman.

On the 24th a freight train on the Nashville, Chattanooga & St. Louis road was thrown from the track by a misplaced switch near Summit, Tenn., and the engine rolled over down a bank and was damaged.

On the 31st a freight train on the Great Western road was thrown from the track by a misplaced switch near Simcoe, Ont. The engine and 12 cars went down a bank and were wrecked; the wreck caught fire and was destroyed. The engineer was killed, the fireman and a brakeman hurt.

DERAILMENTS WITH MALICIOUS INTENT.

Very early on the morning of the 18th a passenger train on the Denver, South Park & Pacific struck a piece of wood, which had been jammed down between the main and guard rails on a sharp curve near Archer, Col. The engine was thrown from the track, went down a high bank and was wrecked, killing the fireman. It is said that he might have jumped and saved himself, had he not waited to put on the air-brakes.

On the night of the 25th a passenger train on the Grand Rapids & Indiana road struck some ties, which had been piled on the track near Hobart, Mich. The engine jumped clear over the obstruction, carrying most of the train with it, and little or no damage was done.

On the night of the 27th a passenger train on the New Castle Branch of the Pittsburgh & Lake Erie road ran into a lot of stones and logs piled on the track near New Castle, Pa., and the engine was thrown from the track.

DERAILMENTS, UNEXPLAINED AND MISCELLANEOUS.

On the morning of the 5th the rear car of a passenger train on the Richmond & Petersburgh road ran off the track near Temple's Crossing, Va. The car upset and was wrecked, injuring six passengers.

On the morning of the 6th six cars of a freight train on the New London Northern road ran off the track at South Amherst, Mass., and several of the cars were wrecked, blocking the road seven hours. A track-walker, who was standing by the road waiting for the train to pass, was slightly hurt.

On the morning of the 8th a shifting engine and six cars broke down the guard at the end of a siding at the Philadelphia & Reading depot at Ninth and Green streets, Philadelphia, and ran into one of the waiting rooms, breaking down a wall and doing much damage.

On the 10th, a freight train on the New York Central & Hudson River road ran off the track in Buffalo, N. Y., wrecking nine coal cars.

On the afternoon of the 11th, a car of an oil train on the New York Central & Hudson River road ran off the track near Rome, N. Y. The oil caught fire and the whole train was burned up, the fire blocking the road several hours.

On the morning of the 12th, as a passenger train on the Pennsylvania Railroad was backing across from one track to the other at Conemaugh, Pa., to get round a freight wreck, two cars ran off the track, delaying the train an hour.

On the night of the 13th a freight train on the New York, New Haven & Hartford road was thrown from the track near Meriden, Conn., and five cars were wrecked. The accident was caused by the breaking down of an overloaded car.

On the 21st the engine and baggage car of a passenger train on the Eastern Railroad ran off the track at Somerville, Mass., delaying the train for a time.

On the afternoon of the 23d a special excursion train on the South Pacific Coast road was thrown from the track near Felton, Cal. The train consisted of an engine and three excursion cars, temporarily prepared by putting seats

and an awning on ordinary flat cars, and was running between Big Tree station, where a large excursion party from San Francisco was, and Santa Cruz. On this trip the cars were well filled, and the train was running around a curve near Felton when the first car jumped the track and upset, the second car followed it and was thrown across the track, the third car remaining on the track and running right into the wreck. The passengers were thrown in every direction; the most careful report says that 15 were killed at once, three hurt so that they died soon after, and 51 less severely injured. The only cause assigned is that the train was running too fast around a sharp curve.

Very early on the morning of the 25th some cars of a freight train on the Chicago, Rock Island & Pacific road ran off the track at Englewood, Ill., blocking the road for a time

Very early on the morning of the 29th a freight train on the New York & Greenwood Lake road ran off the track on the trestle approach to the bridge over Penhorn Creek, near Snake Hill, N. J. The cars nearly all left the track and upset into the mud; the trestle was also damaged, blocking the road nearly 12 hours.

OTHER ACCIDENTS.

On the afternoon of the 27th a car in a passenger train on the Pennsylvania Railroad caught fire near Elizabethtown, Pa., and was almost destroyed, delaying the train an hour.

This is a total of 46 accidents, whereby 30 persons were killed and 107 injured. Eight accidents caused the death of one or more persons; 11 caused injury but not death, leaving 27, or 58.7 per cent. of the whole number in which there was no injury serious enough for record.

As compared with May, 1879, there was an increase of nine accidents, of 25 in the number killed and of 87 in that injured.

These accidents may be classed as to their nature and causes as follows:

COLLISIONS	
Rear collisions	6
Butting collisions	5
	—11
DERAILMENTS:	
Broken wheel	1
Broken axle	4
Broken draw-bar	1
Broken switch rod	1
Broken-down car	1
Broken bridge	1
Spreading of rails	2
Wash-out	3
Cattle on track	1
Misplaced switch	6
Running off end of siding	1
Malicious obstruction	3
Unexplained	9
	—34
Car burned while running	1
Total	46

Three collisions were caused by trains breaking in two, and one by a mistake in orders. One was due to the over-confidence of an engineer, who thought he could save time by running to the next siding, instead of waiting where he was for an opposing train.

The only broken bridge recorded failed because the abutments had been partly washed away by a freshet, leaving the bridge almost unsupported.

A general classification shows 13 accidents traced directly to defect or failure of road or equipment: 4 caused by the elements or the weather; 1 by unforeseen and accidental obstructions; 16 by carelessness or defects in management: 3 were maliciously caused, and 9 are unexplained.

As to time there were 27 accidents in daylight, and 14 in darkness, while the time of 5 is not definitely given.

The division according to classes of trains is as follows:

Accidents:	Collisions.	Derailments.	Other Accidents.	Total.
To passenger trains	..	16	1	17
To a passenger and a freight	5	..	..	5
To freight trains	6	18	..	24
Total	11	34	1	46
Casualties:				
Killed by	2	28	..	30
Injured by	21	86	..	107
Total	23	114	..	137

The month had the smallest number of accidents recorded for any month since May of last year. There were very few collisions, less even than the usual proportion. Accidents from wash-outs appear, although the month was generally dry. Cattle on track appeared only once. There were a large number of broken axles for a summer month. Why it should be so cannot be told, but the month of May has an unusually small proportion of accidents for several years.

It is only in the small number, however, that last month had an advantage. Six accidents from misplaced switches and three malicious derailments make the record far from being a creditable or a pleasant one. Constant reiteration may make a subject tiresome, but it cannot be said too often that the frequent occurrence of accidents caused by switches carelessly left wrong is an evidence of lax discipline and a standing disgrace to our managers. Surely some of these could be prevented by ordering sure punishment for every open switch, and enforcing the order.

The month also had an unusual number of casualties. There were many fatal accidents in proportion to the whole number; and one, that on the narrow-gauge road in California, which had more killed and wounded than any this year, and more, we believe, than any accident since the Wollaston collision.

For the year ending with May the record is as follows:

	Number of accidents.	Killed.	Injured.
June	64	18	55
July	81	14	54
August	79	19	59
September	78	8	47
October	104	35	96
November	86	16	64
December	69	18	72
January	62	11	50
February	64	16	49
March	65	9	33
April	71	11	45
May	46	30	107
Totals	869	205	731
Totals, same months 1878-79	802	200	797

LOCOMOTIVE RETURNS, FEBRUARY, 1880.

Master Mechanics of all American railroads are invited to send us their monthly returns for this table.

NAME OF ROAD.	Number of miles operated	Number of locomotives in service	MILEAGE. Total	MILEAGE. Average per engine.	MILES RUN TO Ton of coal	MILES RUN TO Cord of wood	MILES RUN TO Pint of oil	Average No. cars hauled	Average cost per freight car per mile, cents	COST PER MILE IN CENTS FOR Repairs	Fuel	Stores	Miscellaneous	Engineers, firemen and wipers	Total	AVERAGE COST OF Coal per ton	Wood per cord.
																$	$
Allegheny Valley, River Division*	139	38	79,016	2,079	38.25	....	21.40	20.10	0.815	6.24	2.94	0.52	....	5.94	15.64	.....	.....
Low Grade Div†	120	18	34,812	1,934	25.70	.....	17.50	21.70	0.838	6.41	4.01	0.69	.....	5.99	17.10	.....	.....
Atlantic & Great Western, 1st and 2d Divs	228	82	206,453	2,518	36.21	.....	16.58	18.10	.....	2.95	6.60	0.53	1.35	5.08	16.51	2.31	2.84
Third and Fourth Divs	107	50	133,487	2,669	28.28	.....	24.70	17.90	.....	2.52	8.86	0.38	0.77	5.01	17.54	2.44	2.84
Mahoning Div	88	48	133,634	2,784	37.54	.....	22.42	19.00	.....	3.26	6.25	0.41	1.16	5.03	16.11	2.28	2.84
Camden & Atlantic	67	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.....	.....
Central Pacific, Western Div.†	200	90	72,230	2,408	51.92	....	21.86	.....	.....	6.74	11.38	0.43	0.37	7.26	26.06	5.75	5.50
Northern & San Pablo Div.†	104	29	64,140	2,212	43.52	.....	21.60	.....	.....	10.97	13.54	0.41	0.37	7.54	32.83	5.75	5.50
Visalia Div.†	157	10	23,110	2,311	42.18	.....	23.95	.....	.....	4.75	13.77	0.55	0.19	6.89	25.86	5.75	5.50
Tulare Div.†	170	12	27,497	2,291	40.96	.....	17.96	.....	.....	4.53	14.21	0.50	0.25	7.32	26.81	5.75	5.50
Los Angeles, San Diego, Yuma & Wilmington Divs.†	598	27	60,187	2,599	49.87	.....	19.53	.....	.....	4.29	11.60	0.46	0.17	6.86	23.47	5.75	5.50
California Pacific Div.†	179	12	27,190	2,266	38.66	.....	26.45	.....	.....	3.21	15.23	0.35	0.86	7.07	26.72	5.75	5.50
Stockton & Copperopolis†	49	3	5,060	1,687	45.55	.....	30.91	.....	.....	1.91	13.38	0.41	0.44	6.02	22.16	5.75	5.50
Sacramento Div.†	119	37	75,702	2,047	.....	32.23	23.13	.....	.....	2.83	17.06	0.38	0.42	8.72	29.41	.....	5.50
Oregon Div.†	151	6	18,924	3,154	.....	48.40	30.47	.....	.....	1.01	11.36	0.29	0.17	7.46	20.29	.....	5.50
Truckee Div.†	205	29	56,295	1,938	36.77	32.62	15.82	.....	.....	9.40	16.90	0.41	0.37	8.38	34.91	5.75	5.50
Humboldt Div.†	200	16	42,094	2,631	38.07	.....	25.03	.....	.....	7.88	15.31	0.34	0.45	7.81	31.79	5.75	5.50
Salt Lake Div.†	219	26	64,037	2,463	29.51	.....	19.74	.....	.....	6.06	19.64	0.46	0.25	7.18	33.58	5.75	5.50
Chicago & Eastern Illinois‡	153	32	84,499	2,641	28.00	.....	17.00	.....	.....	3.36	4.70	0.41	.....	5.29	13.76	.....	.....
Cin., LaFayette & Chicago§	75	10	29,928	2,993	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cleve., Col., Cin. & Ind	472	....	397,548	....	36.38	.....	25.20	.....	.....	2.91	6.58	0.55	.....	6.68	16.72	2.27	2.75
Cleveland & Pittsburgh*	225	83	152,107	1,832	39.77	.....	19.53	16.56	0.916	3.79	3.79	0.48	2.09	6.37	17.02	1.40	4.20
Cleveland, Tus. Valley & Wheeling	140	17	40,100	2,359	40.12	.....	19.98	35.00	.....	4.18	2.50	0.41	.....	6.13	13.22	0.90	2.00
Dela., Lacka. & Western, Bloomsburg Div.§	80	21	55,561	2,646	.....	.....	33.80	.....	.....	1.70	.....	0.52	.....	4.75	7.03	.....	.....
Erie & Pittsburgh*	98	27	51,164	1,895	38.94	.....	16.82	15.40	1.277	5.22	4.97	0.58	1.81	6.17	18.70	1.94	1.94
Grand Rapids & Indiana	332	45	126,774	2,817	36.89	38.19	17.19	.....	.....	2.00	8.31	0.45	1.18	5.30	17.74	3.40	2.50
Green Bay & Minnesota	240	14	32,615	2,329	37.43	23.90	24.12	.....	.....	2.01	9.44	0.27	0.04	4.20	15.96	4.80	2.00
Houston & Texas Central¶	512	62	182,046	2,936	45.30	34.20	15.80	.....	.....	4.35	7.28	0.37	1.17	6.61	19.79	3.05	2.60
Illinois Central, Chicago Div.‖	402	94	248,880	2,435	31.21	.....	15.43	19.22	.....	7.03	4.74	0.31	.....	5.73	17.82	1.40	3.75
North Div.‖	345	53	129,082	2,436	27.26	.....	13.46	15.42	.....	4.18	5.37	0.34	.....	5.47	15.36	1.40	3.75
Springfield Div.‖	113	11	28,768	2,615	27.95	.....	17.21	14.04	.....	2.05	4.06	0.33	.....	4.40	11.64	1.25	2.90
Iowa Div.‖	401	42	99,807	2,373	28.99	.....	17.06	12.73	.....	4.44	7.19	0.29	.....	5.81	17.73	2.00	5.25
Indianapolis, Cin. & LaFayette	225	46	117,877	2,563	36.18	.....	21.59	.....	.....	3.69	7.76	0.23	.....	5.76	17.44	.....	.....
Jeffersonville, Madison & Ind*	226	41	90,817	2,215	40.65	.....	13.12	23.59	0.840	2.06	6.30	0.42	2.17	5.73	16.68	2.40	2.10
Kan. City, St. Jo. & Council Bluffs**	247	36	96,789	2,688	38.70	.....	26.00	19.50	.....	4.00	7.10	0.30	.....	6.70	18.10	2.80	3.75
Lake Shore & Mich. So., Buffalo Div.‡	....	84	174,632	2,078	29.47	65.55	22.17	.....	.....	3.80	8.02	0.32	.....	6.39	19.45	2.60	5.09
Erie Div.‡	....	117	242,553	2,073	32.38	.....	27.18	.....	.....	3.85	7.41	0.31	.....	5.71	17.33	2.26	5.43
Toledo Div.‡	....	80	183,933	2,008	25.80	70.74	20.11	.....	.....	3.97	10.20	0.37	.....	5.81	20.38	2.37	5.88
Mich. Southern Div.‡	....	207	433,618	2,094	33.52	50.20	22.72	.....	.....	3.40	9.35	0.29	.....	5.04	18.74	3.10	4.33
Little Rock, Miss. River & Texas	....	....	10,000	....	....	52.00	9.00	.....	.....	3.00	3.82	0.67	2.02	8.38	17.89	.....	2.00
Louisville & Nashville, First Div.††	332	57	119,241	2,092	28.43	.....	14.21	17.24	1.370	1.93	7.25	0.23	1.50	6.86	17.85	1.98	2.30
Second Div.††	200	33	80,149	2,429	28.92	.....	20.45	14.95	1.210	4.74	6.76	0.25	1.46	6.12	19.31	1.86	2.51
Memphis Div.††	131	20	42,078	2,104	31.77	.....	17.39	15.73	1.530	4.39	8.04	0.38	1.06	5.65	20.02	2.69	2.60
Nash. & Decatur Div.††	122	22	51,951	2,361	20.22	.....	14.91	14.83	1.340	7.54	7.63	0.31	1.74	6.09	23.31	1.94	2.30
South & North Alabama††	180	32	80,573	3,018	32.48	.....	18.76	18.56	1.980	3.56	5.04	0.34	1.04	5.51	16.11	1.81	2.00
Evansville, Hen. & Nash. Div.††	135	28	62,063	2,217	31.77	.....	19.85	13.17	1.420	2.32	4.41	0.25	1.44	5.88	14.30	1.36	1.75
Marquette, Houghton & Ontonagon	88	11	13,018	1,183	43.40	.....	22.68	19.77	.....	1.20	9.84	0.50	.....	5.74	17.28	.....	.....
Missouri, Kansas & Texas‡‡	795	86	285,542	3,320	36.65	....	18.39	16.70	1.050	3.07	5.10	0.40	0.79	6.35	15.71	.....	.....
North. Cent., Elmira & Can. Divs.	147	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.....	.....
Ohio & Mississippi	622	....	346,240	....	26.66	.....	11.03	.....	.....	5.19	5.07	0.54	.....	6.82	17.62	1.13	2.00
Pennsylvania, New York Div.§§	120	109	310,241	2,846	29.14	.....	10.64	.....	.....	5.30	10.40	0.80	.....	.....	16.50	3.00	3.60
Amboy Div.§§	186	48	89,660	1,848	45.88	.....	15.24	.....	.....	3.00	6.60	0.50	.....	.....	10.10	3.00	3.60
Belvidere Div.§§	103	35	58,232	1,578	32.37	.....	13.19	.....	.....	4.20	9.40	0.60	.....	.....	14.20	3.00	3.61
Philadelphia Div.§§	172	133	381,353	2,703	25.25	.....	13.26	.....	.....	5.30	5.00	0.60	.....	.....	10.90	1.20	2.80
Middle Div.§§	132	109	302,708	2,775	24.80	.....	16.13	.....	.....	3.50	5.10	0.50	.....	.....	9.10	1.20	2.80
Pittsburgh Div.§§	226	108	445,798	2,654	24.22	.....	12.24	.....	.....	5.20	5.10	0.60	.....	.....	10.90	1.20	2.80
Tyrone Div.§§	116	32	64,018	2,001	21.41	.....	16.18	.....	.....	5.30	5.70	0.50	.....	.....	3.50	1.20	2.80
West Penn. Div.§§	104	22	37,271	2,694	30.51	.....	30.48	.....	.....	6.50	4.10	0.30	.....	.....	10.90	1.20	2.80
Lewistown Div.§§	63	9	16,042	1,782	22.43	.....	15.84	.....	.....	3.50	5.40	0.50	.....	.....	9.40	1.20	2.84
Bedford Div.§§	57	5	10,905	2,181	24.28	.....	28.25	.....	.....	12.90	5.00	0.30	.....	.....	18.20	1.20	2.82
Frederick Div.§§	109	8	16,550	2,069	31.41	.....	19.30	.....	.....	1.20	10.0	0.60	.....	.....	11.80	3.10	4.58
Pittsburgh, Va. & Charleston Div.§§	30	14	17,515	1,251	46.20	.....	14.20	.....	.....	5.70	2.60	0.50	.....	.....	8.80	1.20	2.06
Pitts., Ft. Wayne & Chi., East. Div.*	471	153	385,350	2,519	40.46	.....	22.56	15.30	0.922	3.82	4.67	0.33	1.72	6.07	15.54	1.82	1.82
Western Div.*	280	111	276,695	2,493	36.80	.....	19.10	22.90	0.859	5.20	3.89	0.39	2.47	6.07	18.02	1.43	1.43
Pitts., Cin. & St. Louis, Little Miami Div.*	197	39	92,121	2,362	41.82	.....	12.44	16.07	1.048	5.42	6.44	0.53	2.42	5.55	20.36	2.63	1.50
P., C., & St. L. Div.*	224	109	226,348	2,263	26.72	.....	19.16	18.53	0.910	6.26	4.09	0.40	2.08	5.47	18.80	1.05	1.85
St. Louis & Southeastern	208	....	50,818	.....	43.70	.....	15.40	.....	.....	3.10	2.80	0.25	.....	4.81	10.96	1.14	.....
Savannah, Florida & Western	345	22	63,310	2,877	.....	43.06	20.03	.....	.....	2.50	3.90	0.30	.....	6.50	13.30	.....	1.71
Toledo, Peoria & Warsaw	327	41	102,498	2,500	34.16	.....	17.70	16.54	.....	3.53	4.07	0.33	.....	6.34	14.97	1.30	2.50
Wabash, St. L. & P., Ohio & Ind. Div.¶¶	250	108	200,229	2,465	31.41	.....	13.65	24.98	0.78 ¶	4.45	5.57	0.46	.....	7.06	17.54	1.75	.....
Illinois Division††	441	78	201,067	2,578	32.00	.....	13.60	21.68	0.950	4.69	4.66	0.33	.....	6.57	16.25	1.50	.....
West Jersey§§	128	19	31,319	1,648	42 25	.....	17.55	.....	.....	2.30	8.60	0.50	.....	.....	11.40	3.60	3.47

* Five empty cars rated as three loaded ones.
† Switching engines allowed 6 miles per hour; helping engines, actual distance run and 4 miles per hour while waiting trains.
‡ Switching engines allowed 6 miles per hour.
§ Fuel not estimated.
‖ Two empty cars rated as one loaded one.
¶ Switching and work-train engines allowed 6 miles per hour.
** Three empty cars rated as two loaded ones.
†† Switching engines allowed 6 miles per hour; five empty cars rated as three loaded ones.
‡‡ Switching engines allowed 6, work-train 8 miles per hour.
§§ Engineers', firemen's and wipers' wages not included in cost.
The ton of coal is 2,000 lbs., unless otherwise noted; 25 bushels counted to the ton.

The averages per day for the month were 1.48 accidents, 0.97 killed, and 3.45 injured; for the year they were 2.37 accidents, 0.56 killed, and 2.00 injured. The average casualties per accident were, for the month, 0.652 killed and 2.326 wounded; for the year, 0.236 killed and 0.841 injured. The casualties for the month are very much above the yearly average.

RAILROAD LAW.

Boiler Explosions—Negligence.

In these days when disasters on land and water are common, and no person is found to blame, a recent decision of the United States Circuit Court in Georgia may prove a wholesome lesson to the managers of steamboat and railroad lines. The action was brought by an Episcopal clergyman to recover for injuries that he had received while a passenger on the defendant's steamboat. This boat was a regular passenger and freight packet between Jacksonville, Fla., and Savannah, Ga. One night between 11 and 12 o'clock, while the steamer was going up the St. Mary's River, one of the boilers exploded. The plaintiff suffered injuries which made him a permanent cripple. On the trial it was proved that the boilers had been inspected by the government officers, and repaired a short time before the accident, and were apparently sound. The pump was also a good one. There was a glass water-gauge, and there were water-cocks for ascertaining the quantity of water in the boilers. It appeared from the testimony of experts that reliance could not safely be put in the glass water-gauge alone, but that it was necessary to test the water-cocks. There was evidence showing that the engineer of the boat was not in the habit of using the water-cocks, and, furthermore, that he was not a strictly temperate man. On both of these points, however, the testimony was conflicting. Another item of the evidence was a piece of one of the boilers found after the explosion. It had been burned to such an extent that it was brittle and easily broken. Experts gave the opinion that a burned boiler was presumptive evidence of negligence on the part of the engineer. In applying the law to these facts, the court remarked that carriers of passengers are not insurers of the safety and lives of those whom they carry, but they are bound to use the utmost knowledge, skill and vigilance in order to carry their passengers in safety. In this case the explosion of the boiler made out a *prima facie* case of negligence against the boat-owners, and they were bound to remove that presumption by positive evidence before they could escape liability. The explosion must have been caused by some latent defect in the boiler which the closest examination could not discover, or it must have been the result of negligence. The defendants had to prove the former or be held liable for the latter. "We are asked," said the court, "to find that the explosion was caused by some hidden defect in the material of the boilers, and not to defects caused by carelessness and bad management. No hidden defect is shown to exist. The facts prove that the engineers were careless and negligent, and the result of that negligence is shown by the condition of the boilers at the time of the explosion. The natural and almost unavoidable inference is that the explosion was the result of the bad treatment of the boilers by the engineers, and not the result of some concealed flaw." Judgment for $5,000 was thereupon given in favor of the plaintiff.—*New York Times.*

Property in Railroad Tickets.

A conductor was tried before the Court of Oyer and Terminer in Camden, N. J., recently, for robbing the Pennsylvania Railroad Company by failing to punch tickets taken up by him, and then handing them to a confederate for sale. The indictment was for stealing from the company, and the defence was that no such offense as was charged in the indictment had been proved, since the ticket, when sold and paid for, became the property of the purchaser, and the company was divested of any such property right as justifies a prosecution for larceny, for its being withheld. The Court supported this view and discharged the prisoner. It is possible that steps may be taken to test this decision further.

Accident Damages—Negligence.

In Atlanta and West Point Co. against Wyly, appeal from Fulton Court, the Georgia Supreme Court has decided as follows:

1. While negligence, as a general rule, is a question for the jury, yet where the statute makes a certain act, having a material bearing on the case, imperative upon the agents of a railroad company, the Court may instruct the jury that proper diligence required such act. Thus, in a suit for damages to a dray by a train, at a street crossing in a city, the negligence of defendant's agents being in question, there was no error in charging that proper diligence required the tolling of the locomotive bell in approaching a crossing in a city.

2. In a suit against a railroad for injury to personal property in charge of plaintiff's agent, the rule of damages is this: If the injury occurred wholly by the agent's fault, there could be no recovery; if by the mixed fault of the agent and the company, there could be a recovery, but diminished in proportion to the agent's fault; if wholly by the fault and negligence of the company's agents, then there could be a recovery of full damages. Taken as a whole, this seems to be the effect of the judge's charge.

Judgment affirmed.

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EDITORIAL ANNOUNCEMENTS.

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THE CONSTRUCTION OF CAR-TRUCKS.

It is probably quite within the limits of exact truth to say that there is no portion of the mechanism of railroads which, in relation to the service it must perform, is as rude and imperfect in its construction as are car trucks. The fact that they form the distinctive feature of American rolling-stock, gives to their imperfections somewhat of the character of a national discredit. For years we have assumed the superiority of our "bogie system," as our Anglican cousins phrase it, and have apparently trusted so implicitly to the advantages of the "system," that we have neglected to improve the design, construction and workmanship of its component parts. That it is susceptible of great improvement, there can be no doubt, as will appear very plainly if we reflect a little on the work which a car truck must do, and then observe the mechanism employed to do it.

Thus let us take the wheels. It would seem as though the first consideration would be that they should be round and concentric with the axles. Instead of this being the case, those who have investigated the subject report that in cast-iron wheels taken at random, they have found the most surprising deviation from a true circular form and from concentricity with the axles.

In nearly all other machinery of which rapidly revolving wheels form a part, the utmost care is taken to balance them truly. Until very lately, this has not received any attention whatsoever, and car wheels have been put into service without even so much as thinking whether they were balanced or not. That two rough castings usually made with one or more internal cavities cored out should not be in a state of equilibrium when attached to an axle is not surprising, and it is therefore not to be wondered at that recent tests should reveal some very serious causes for disturbance in the rotary motion of cast-iron car wheels.

It is apparent, too, that if two wheels on the same axle are to roll in a straight line that they should both be of the same diameter. As a matter of fact it is found that often a considerable variation exists in the sizes of wheels which form a pair. The effect of this on the resistance and on their wear can readily be imagined.

To roll in a straight line with the least resistance the axles of the two pairs of wheels, which form a truck, must be parallel with each other and the wheels on each side must be in the same plane, so as to "track" the one with the other. Not only must the axles be parallel, but their contour, or the figure of which their two centre lines form opposite sides and which is completed by lines uniting the ends of the axles, must be rectangular and not of a trapezoidal form. That is, the truck frames must also be parallel to each other and at right angles to the axles. If the truck is not "square," as it is termed, one or more of the wheels will be inclined to the rail and the flanges will run against it, thus increasing both the resistance and the wear.

As a matter of fact a large proportion of the trucks in use are not "square." If a careful examination was made of the trucks found under a miscellaneous number of cars, it is believed that the most surprising deviations from their correct geometrical position in relation to each other would be discovered, a fact of which the frequent wear of wheel-flanges is the evidence.

If journal-boxes and bearings are carefully examined, it will also be found that their whole construction is one of the most imperfect pieces of mechanism in use. One of the chief purposes which they must perform is to hold the axles in their proper position. Let us see how much probability there is that they will do this. A journal-box is simply a rough casting made with a more or less rude core cast in it. The journal-bearing is also a rough casting, seldom or never finished, excepting on the surface which bears on the axle. It is placed in its position in the box where it is held by lugs, which must allow of more or less "play," so as to make it certain that it will always enter. The "play" is also required so that the bearing may adjust itself to the journal in any position. It would, of course, be possible to make a bearing which would be adjustable, but which would, at the same time, hold the axles in exactly the right positon. The ordinary journal-bearing is, however, not of this kind, but must be made smaller than would be required for a good fit in its seat, in order that it may always enter, and that it may not "bind" on the journal. The probabilities that the axles of trucks made with this sort of rude contrivance will be "square," and the wheels in line so as to "track," may be imagined and may be shown practically in any railroad yard where a considerable number of miscellaneous cars are collected together.

The dust-guard, too, is an equally rude contrivance. Its object is to prevent the oil from leaking out and the dust from entering the box through the opening in the back which receives the axle. To do this, there should be a joint for the axle to turn in, which would prevent oil from leaking through. The contrivance generally used for this purpose consists of a piece of leather, wood or vulcanized fibre inserted in a rough recess cast in the box, and with a hole just large enough to receive the axle. No attempt is made at fitting the packing, as it is called, or no provision made for its wear. It should not be surprising, then, that it fulfills its purpose only partially, which is shown by the fact that car-trucks are nearly always covered with oil and grease which has leaked out of the journal-boxes, and in fact the marks of such leakage are generally trailed on the track from one end of a railroad to the other. When oil can leak out, dust can, of course, leak in; and if the combined loss due to the leakage of oil and the abrasion of journals and bearings, which is due to the ineffectiveness of dust-guards, could be counted, it would sum up to an enormous aggregate.

So long as inequalities in railroad tracks exists, car trucks must be subjected to both vertical and lateral shocks and blows. The side concussions are communicated to the rails by the flanges of the wheels, and to the latter through the journal-bearings and axles. The consequence is that the journal-bearings must resist a great deal of lateral strain, and are subjected to constant wear from that cause. Any intelligent mechanic who will carefully consider the nature and severity of these concussions, and will observe their effect on journals and journal-bearings, must be convinced that these parts form a very imperfect contrivance for doing the work or for resisting the wear to which they are exposed. The several forms of collarless journals with end bearings seem to possess advantages, and to provide more effective means for resisting this wear, but up to the present time they have not been very extensively used.

If the truck or "bogie" system of building cars and locomotives has any merit, it is due, of course, to the fact that the trucks will turn around their centre-pins, or king-bolts, so as to adjust themselves to the curvature of the track. If they do not turn freely the advantage of the system is defeated in somewhat the proportion of the resistance of the parts to turning. That this resistance is often very considerable is indicated in a variety of ways. The surfaces on which the car must turn—that is the centre-plates and side bearings—are seldom made with any appliances for oiling them or for retaining oil. It is also impossible to inspect the centre-plates to see whether they are oiled without raising up the car-body. The result is that they get so dry that, with the great weight they must bear, the surfaces "seize" as English engineers say.

Another defect which seems to exist in the construction of cars with trucks is that there is no efficient provision for distributing the load of the body on the trucks in passing over lateral inequalities of the track. The "three-legged principle," as it is called, derived its name from the fact that a three-legged stool or tripod will rest firmly on any surface however uneven. In locomotives, where it is important that the wheels should have a uniform bearing, this principles is generally applied, that is, the running gear is so arranged that ultimately the weight of the engine rests on three points. The same plan is adopted for tenders. The back trucks are usually made with side-bearings and the front ones with centre-bearings, so that the weight of the frame or body of the tender rests on these point. In car construction, however, this principle is not adopted, but a sort of indefinite compromise is the usual practice, that is, both trucks are made with centre-bearings, and the side-bearings are so arranged that when the car body is in its normal position it does not rest on them, but a little space is left between them and the body so that if any rocking or lateral motion occurs to the truck or the body, the movement of the latter will be arrested by the side-bearings. It can readily be seen that if one truck should be inclined sufficiently that the car body will then be supported on its diagonal corners, the effect of which is to twist or "rack" its whole framing. If one truck were made with side-bearings and the other with a centre-bearing, each of them could then adjust themselves to vertical inequalities in the track without subjecting the body to undue strain.

If we bear in mind the fact that all railroads consist of parallel iron bars, laid a definite distance apart, and that cars consist of vehicles whose wheels have flanges which must run between these bars and are the sole means by which the wheels are kept on the rails, it would seem as though the distance apart of these flanges would be a matter which would be carefully provided for and determined with the greatest exactness. Instead of this being the case, it seems very commonly as though it was left to chance. If a railroad company buys a piece of land in all cases it employs a lawyer who will examine the title and determine its boundary and dimensions with the utmost care, but in buying or building rolling-stock, which is of many-fold the value of the real estate, hardly a thought is given to its dimensions, even though these concern its most vital functions. It is hard to understand the general apathy which exists in relation to this subject. Persons who have measured the gauge of the wheels from different roads, have found a most astonishing amount of variation in this respect, and at present it seems impossible to establish a standard which will be generally adopted. There can be no doubt, though, that in the gauge of the wheels the most culpable negligence, carelessness and indifference prevails.

There is no record that we know of which shows the first form adopted for the flanges of wheels, nor of the shapes which they have gradually assumed. Wood's treatise on railroads and Pambour's book on locomotives contain sections of tires, the form of which does not differ materially from those now in use. These were published in 1836 and 1838. The fact seems to be that the present shape of flanges and also of rails has been assumed to be right without any good or sufficient reason for it, excepting that it worked well in practice. In other words, there are no adequate reasons for inferring that the present form of wheel flange is the best that is possible. It has been adopted empirically, and there is no sound theory to recommend it. It seems quite within the range of possibility that an elaborate investigation might indicate some important and valuable modifications in the form of these very important parts of all railroad vehicles.

Having then pointed out the existing and the possible defects in the construction of railroad car trucks, the question naturally arises, how could they be improved? Before answering this it will be well to enquire whether such improvements are likely to be economical. In the report of the experiments on train

resistances made by Baron Von Weber, published in the *Railroad Gazette* two weeks ago, he says: "Even vehicles of uniform construction and weight, in consequence of various irregularities and according to their degree of wear, exhibit very different resistance, some being even twice as great as others. Moreover, runs with the same identicle vehicles, on the same track and with the same initial speed, never give the same results." Experimenters in this country have observed the same fact, which indicates some cause which produces irregularity of working. Doubtless the more perfect the track and the running gear of the car, the more nearly uniform would the resistance be. The irregularities noted are a measure of the imperfections of the vehicles, and also of the track. If this is true, the inference would be that if the construction were improved, the resistance of all rolling-stock could be reduced at least to that which has been observed to be the lowest, and possibly even below that. The importance of this may be realized from the fact that the resistance of some cars at moderate speeds is reported to be as high as 8 lbs. per ton on a level and straight line, whereas in others it was as low as 5 lbs. at the same speed. Now, it might be hastily inferred, and some inventors of axles and journal bearings reason thus, that as this represents a diminution of resistance of three-eighths on a level, that an engine would therefore draw a load in inverse proportion to these resistances, if the lighter draft cars are used. They forgot the influence of gravity on a grade. To show what this is let us take the resistance of a train at 20 miles an hour and on different grades, given in the table on page 596 of the Catechism of the Locomotive. It will also be assumed that by improved methods of construction the resistance can be reduced three lbs. per ton. In the following table the reductions are made and in the last column the percentages of reduction are calculated.

Grade in feet per mile.	Resistance in lbs. per ton at 20 miles per hour.	Resistance reduced 3 lbs. per ton.	Percentage of reduction.
0	8.3	5.3	36.0
10	12.0	9.0	25.0
20	15.8	12.8	19.0
30	19.6	16.6	15.3
40	23.4	20.4	12.8
50	27.2	24.2	11.0
60	31.0	28.0	9.6
70	34 8	31.8	8.6
80	38.6	35.6	7.7
90	42.3	39.3	7.0
100	46.1	43.1	6 5
150	65 1	62.1	4.6
200	84 0	81.0	3.5
300	121.9	118.9	2.5

From this it will be seen that on a level the resistance would be reduced 36 per cent., whereas on a grade of 50 feet per mile the reduction would be only 11 per cent; on a 100-feet grade, 6.5; on one of 200 feet, 3.5; and on a 300-feet grade only 2.5 per cent. Small as these reductions appear on the steeper grades, yet every railroad manager who has ever given attention to this subject knows how very great the economy is which is due to even a small increase of train load. If the resistance is diminished it becomes possible to increase the size of trains.

If the improvement of car-trucks is proposed, the objection may, of course, be raised that it means additional cost, which may or may not be true. What would seem to be the proper course to pursue would be first to investigate the matter thoroughly to determine whether it is possible by a more perfect design and construction of trucks to diminish their resistance materially. If this is once established the problem which would then present itself, would be how to design their parts so as to secure all the advantages sought, and at the same time keep the cost as low as possible, and also to provide special tools and machinery to do the work at the least expense. To do this the highest order of mechanical skill and experience must be enlisted. Unfortunately a very low estimate seems to be placed in the value of such ability by most railroad managers, and generally it is only when those who possess it can secure a suitable compensation through the patent laws that they will devote themselves to perfecting railroad appliances. There is, however, great room for improvement which is not patentable and it is here that the lack of the highest order of mechanical knowledge and skill in railroad operation is most apparent.

OBJECTIONABLE PASSENGERS.

A very responsible and difficult part of a conductor's duty is in dealing with those who may be called—to group them all under one name—objectionable passengers.

The daily papers have lately narrated what befell a conductor in New Jersey. A passenger appeared intoxicated, was very turbulent and unruly, and quarreled with and even assaulted the conductor, who, however, bore with him in view of his being ticketed to a station not far beyond. That station reached, the fellow alighted but lingered near; and, as the conductor gave the signal to start, the ex-passenger made a savage attack upon him. The conductor struck a strong fist blow under which his assailant fell prostrate; then, springing upon the steps, was soon well on his way. But the man died, and the conductor was summoned back to await investigation by a coroner. The inquest indicates that the offender was perhaps less in fault than was supposed; that he was not drunk but was crazed by a sunstroke; and that death was perhaps due quite as much to brain disorder as to the violence. The case well illustrates how difficult it may sometimes be to deal aright with the "objectionable passenger."

It has become fairly established that colored persons are not "objectionable passengers." The wide-spread prejudice of travelers and the numerous rules and discriminations of carriers against them have so much diminished under the tendency of the times that the only point of controversy in present years is as to some few state laws forbidding the companies to order their colored passengers into separate cars. It is everywhere understood that blacks and whites have equal right to be carried in railroad trains, but some companies have claimed that this right is not infringed by assigning distinct cars for the two races. If the colored passenger is carried for the same fare and in equal comfort and speed with white persons, he has no ground of complaint (so the argument runs) if he is ordered into a car by himself. Some legislatures have thought differently and have forbidden all "colored persons' cars." But the Supreme Court at Washington has pronounced all such state laws unconstitutional, because involving an attempt to regulate commerce. Their argument is that if New Jersey may forbid separation of colors, New York and Pennsylvania may command it, and Delaware in turn forbid it; and a through train may be required to stop at each boundary line to separate or mix its passengers conformably to the law of the state it is entering. Whether the United States civil rights laws, which operate uniformly over the entire country, forbid a railroad to assign negroes to a car by themselves, is a question which awaits authoritative decision at Washington; meantime there is, happily, no longer any dispute that they have full right to travel in comfort. To warrant any exclusion of or discrimination against a passenger, there must be something against him more serious than a dark complexion.

The general doctrine of objectionable passengers was thus stated by Judge Dillon, in a decision which is presumably good authority through the land:

"A railway company is bound, as a common carrier, when not overcrowded, to take all proper persons who may apply for transportation over its line, on their complying with all reasonable rules of the company. But it is not bound to carry all persons at all times, or it might be utterly unable to protect itself from ruin. It would not be obliged to carry one whose ostensible business was to injure the line; one fleeing from justice; one going upon the train to assault a passenger, or commit larceny or robbery, or for gambling in any form, or committing any crime; nor is it bound to carry passengers infected with contagious diseases, to the danger of other passengers. The person must be upon lawful and legitimate business. Hence defendant is not bound to carry passengers who travel for the purpose of gambling. As gambling is a crime under the state laws, it is not even necessary for the company to have a rule against it. It is not bound to furnish facilities for carrying out an unlawful purpose. Necessary force may be used to prevent gamblers from entering trains, and if found on them engaged in gambling, and, refusing to desist, they may be forcibly expelled."

In the particular case before Judge Dillon the conductor had forcibly prevented a holder of a ticket from getting aboard the train. He charged, in excuse, that the would-be passenger was a notorious "monte man," who made a daily practice of traveling back and forth over the road to entice passengers into gambling. The Judge said the excuse was a good one, except that if the gambler had paid for a ticket he was entitled to have his money back.

Intoxication, considered alone, does not deprive a person of his right to travel, nor diminish the obligation of train-men to use due care in his behalf. It is an important fact in the event of an injury sustained by the passenger himself, for intoxication notoriously renders the person less capable of caring for his own safety, and hence increases the probability of contributive negligence. If a person's hurts received in a casualty are attributable to his failure, through drunkenness, or any other cause, to take proper care of himself, he loses any claim against the company. But this is not a question which a conductor has occasion to consider, upon the trip. The question for him in dealing with a drunken man is whether his demeanor is such, either abusive or disgusting, as seriously to alarm, incommode or annoy other passengers. So long as he is neat, quiet and well behaved, the victim of inebriety has the right to ride. But, generally, conductors do not err on the side of severity toward a person of this class. They are apt to allow them to ride after serious objection arises. By so doing they fail in duty and may expose the company to liability. A man got upon the front platform of a New York city horse-car who was obviously drunk, so much so that the driver remonstrated to the conductor against his being allowed to ride on the platform, saying that he was "too full." Instead of putting him off, the conductor brought him into the car and seated him. As described in the law-suit which followed, he was "an intoxicated, quarrelsome, scratched, bloody, dirty, ragged man with his clothing unbuttoned in an indecent manner. Precisely how a quarrel arose between him and a fellow-passenger is not stated, but there was one, and the fellow-passenger was struck several severe blows with the fist, his eyes blackened, his teeth loosened, his lips cut, and his nose injured so much that for ten days afterward he could not chew his food, or swallow comfortably. The jury awarded him $1,000 damages, and the Court said that it was right, except that the sum was not enough. The company was liable because it was a gross neglect of the duty to carry passengers safely, for the conductor to admit such a person to the car.

The conductor's duty is discussed in another aspect in an Ohio decision reported last year, where the conductor did expel the drunkard, and the company was sued for his doing so. Valleley took the cars at about dusk, after having been riding about among saloons during the afternoon, and drinking until he became, as the witnesses described him, "not very drunk, but ugly, fighting drunk." He behaved in such a foolhardy, reckless manner, by leaning off from the platform, that a brakeman interfered to pull him back for his own safety; and this brought on a fight with the brakeman, to the alarm and annoyance of the other passengers. They demanded of the conductor that the fellow should be put off; and this was done, without his sustaining any injury. But he staggered along the track and was run over and killed during the night by another train. His mother sued for damages. The case was twice tried; and it is a singular illustration of the versatility of lawyers, and of the delicacy and difficulty of the decision the conductor is required to make in these cases, that on the first trial the counsel contended that the man was so very little intoxicated that the company had no right to put him off; but, the jury thinking otherwise, they contended in the second trial that he was so very drunk as to be unable to take care of himself, and for that reason could not be expelled. The Court said that when a man is so intoxicated as to be without reason, sense, or intelligence, it would be unlawful, as it would be inhuman, to expel him from cars at night, when he would be most likely to lie down upon the rails and go to sleep; or to put him off in bitter cold weather at a spot far from any house, under a probability that he would freeze to death; or to leave him upon a high bridge or the brink of a precipice, where his first step would be destruction. The authority of the conductor is not absolute, but must be exercised reasonably under the circumstances. He must use his best judgment and discretion; and if he acts not wantonly, not abusively, but with that prudence which the case demands, the company can not be made responsible. In this case the evidence indicated that Valleley was not so drunk as to be bereft of intelligence; on the contrary he was excited, rendered vicious and quarrelsome by the liquor, rather than stupefied. He was not helpless, but furious; flourishing a knife and threatening to shoot. To put him off the train was not only the right but the duty of the conductor. The place selected must not be one involving special danger; but if he afterwards wandered to another spot where he was injured by another train, that was not the fault of the conductor.

These decisions result in imposing a rather difficult rule of duty upon a conductor. With very little opportunity for inquiry, or leisure for examination, he must decide, and decide aright, on the condition of a drunken passenger. If the passenger is not so drunk as to be troublesome, he must be allowed to ride. If he has become seriously offensive or dangerous, he may be put off, with care and prudence. If his inebriation has reached the point of helplessness, he must not be put off without provision for his needs. Cases may occur in which the subject is beyond caring properly for himself, or injuring others, but unfit to travel with ordinary passengers, by reason that his condition is disgusting. To give him a ride *solus* in the baggage car, or, if a horse car is the scene, to put him off, will probably be the most prudent solution of these.

Turbulent, disorderly conduct, without intoxication, may well warrant expelling a person. Indeed, this is the chief feature which renders it lawful to expel drunken men. There is plenty of authority that a

passenger, drunk or sober, forfeits his right to ride by creating violent disorder, such as imperils the safety, or destroys the comfort of others; and the conductor not only may, but must, expel him, choosing a proper place, and using due care. In a case lately published, the passenger became involved in a violent quarrel with the conductor, upon the latter's demanding his ticket. The stories of the two men in court differed widely. According to the conductor's narrative the passenger was asleep when the conductor came through the cars for tickets; the conductor awakened him and demanded his ticket, but the passenger insisted that the conductor had already taken it. The conductor spent a few moments in collecting other tickets, and then renewed his demand, telling the passenger he would be put off if he did not surrender his ticket. The passenger then searched his own pockets and found the ticket, which he exhibited but refused to surrender, and he became so violent, profane and indecent in language and behavior to the conductor that other passengers intervened and demanded to have him expelled, and the conductor then stopped the train, and by the aid of two brakemen put the offending passenger out, using no more force than he rendered necessary by violent resistance. The Court said that if these were the facts the conductor was justified. According to the passenger's narrative he had been traveling for forty-eight hours previously without sleep, hence fell asleep in the car, but when the conductor came for tickets he easily awoke and showed his ticket to the conductor; the conductor soon came again, and in a rude and harsh manner demanded the ticket, and this was done before the usual and proper time of finally collecting them. The passenger could not immediately find his ticket, but had one, as the conductor perfetly well knew, for he had seen it only a few minutes previously. He was not, however, allowed time to find it, but the conductor peremptorily ordered him to be put off the train while he was endeavoring to find the ticket to surrender it. The judges said that if the jury believed this account their verdict should be in favor of the passenger.

A person who pays fare in a counterfeit bill is a very objectionable passenger—may he be put off the train? So the Mississippi Supreme Court decided. The ticket agent discovered, after the train had started, that one passenger had palmed off upon him a false $50 bill, and telegraphed the fact, naming the delinquent, to the conductor, at a way-station; and the conductor enforced repayment of the fare from the passenger. The Court said that payment in counterfeit money was no payment at all, even if the passenger did not know the bill was counterfeit. The railroad company was under no obligation to transport a man, who, however innocently, had defrauded them in the purchase of his ticket, and would have had the right to eject him from the train had he refused to rectify the wrong. But let conductors, before doing likewise, be sure they are in the right upon all the minor details and outlying questions, as well as on the main point, that the bill is false; for by reason of peculiar incidental facts in this case and of mismanagement by the company's lawyer, the passenger recovered $2,000 damages for the detention and expenses, notwithstanding he did not dispute that the bill was bad.

Tractive Force of Locomotives.

The following statement as to the tractive force exerted by one of the engines built at the Springfield shops of the Boston & Albany road was published in the Springfield *Republican* of June 16:

"The recent trials of the power required to draw heavily loaded freight trains, which have been made by P. H. Dudley's dynagraph car with the Eddy engine Arizona, are expected to be of great interest to railroads from the data which they will furnish. The results have not yet been reduced to figures, but it is known the Arizona has displayed extraordinary traction power for an engine of her class, that is, an ordinary eight-wheel engine with four drivers. The test yesterday was made on the grades between here and Worcester with 27 cars loaded with the extraordinary weight of 693 tons. The greatest traction power exerted by the engine was 25,000 pounds, when the brakes happened to be put on. When at a speed of about 9 miles an hour the traction force of 19,000 pounds was shown. The trial was not intended primarily to test the engine, but to ascertain the force required to draw a train, but the power of the engine surprised Mr. Dudley, and is said to be greater than that of any of its class tested by his machine.

The Arizona is an engine which has recently been rebuilt. We have no record of its weight, but some of the more recent locomotives built by Mr. Eddy for this road have 55,000 lbs. weight on four driving-wheels. Assuming the adhesion at one-third the weight on the driving-wheels, which is the maximum ever observed, and we would have 18,333 lbs. As the draw-bars on these engines are placed as high up as practicable, the tendency of the tractive power of the locomotive is to tip the engine up in front and thus transfer part of the weight on the truck to the driving-wheels. It is therefore conceivable that an engine of this kind could exert a tractive force of 19,000 lbs., but it is not clear how it could pull 25,000 lbs. unless, as is indicated, the brakes were applied when the engine was running at considerable speed. In that case the momentum of the engine might for a short distance be added to the tractive force of the steam, and the two together amount to the figures named.

Record of New Railroad Construction.

This number of the *Railroad Gazette* contains information of the laying of track on new railroads as follows:

Minneapolis & St. Louis.—Extended from Forest City, Ia. south by west 30 miles.

Pennsylvania.—Track is laid on the *Lewisburg & Tyrone Branch* from Tyrone, Pa., to Hamer's Mill, 2 miles.

Gulf, Colorado & Santa Fe.—Extended from Brenham, Texas., northward to Yegua Creek, 14 miles.

Bradford, Bordell & Kinzua.—Track laid from Bradford, Pa., southeast, 8 miles; gauge, 3 feet.

Northern Pacific.—The *Missouri Division* is extended from Knife River, Dak., west 25 miles. The *Casselton Branch* is completed from Casselton, Dak., northward 16 miles.

Texas & Pacific.—Extended from Weatherford, Texas, westward 10 miles.

Ohio & West Virginia.—Track laid from Logan, O., southward to Eagle Furnace, 35 miles; also from Gallipolis, O., northwest to Vinton, 15 miles.

This is a total of 155 miles of new railroad, making 1,768 miles thus far this year, against 732 miles reported at the same time in 1879, 482 miles in 1878, 595 miles in 1877, 656 miles in 1876, 336 miles in 1875, 608 miles in 1874, and 1,387 miles in 1873.

ATLANTIC CITY, Philadelphia's most popular sea-side resort is pretty well provided with railroads now. The old Camden & Atlantic, built 25 years ago, first made the place and had the business to itself until two years ago when the Philadelphia & Atlantic City, a narrow-gauge line, was opened. This company, however, had hardly finished its road when it made a disastrous failure and is still in bankruptcy. Not deterred by this failure, the West Jersey Company has just finished a branch line, and the competition for the excursion business this summer promises to be as sharp as ever. Last year excursion rates varied from $1 to $1.50 for the round trip—surely very moderate rates for a ride of 60 miles each way, 120 miles in all—and the business done was enormous. With a popular sea-side resort at one end of a line and a city of 800,000 people at the other, the business is capable of almost indefinite expansion, and the very low rates have probably yielded a fair profit to the roads. The narrow-gauge failed because it was never fairly finished and its finances were badly managed. The new line has an old road for one-half the distance, with its terminal facilities in Philadelphia already provided, and the return from its 34 miles of inexpensive road will probably justify the investment. The competition is between the railroads alone, and the steamboats do not come in to complicate the matter as in New York. Philadelphia is a sea-port, but it is a good many miles from the sea. Atlantic City, the nearest and most popular point on the ocean, is not accessible by boat, and even to Cape May the line is so long and the boat voyage takes so much time, that the railroad has always had the excursion business pretty much to itself. The competition for the Atlantic City business will be active this year between the Camden & Atlantic and the West Jersey, and the narrow-gauge will come in for a share, though it is not able to offer the same advantages as the other two roads.

THE CHICAGO, ROCK ISLAND & PACIFIC, a summary of whose report for the year ending with March is given in another column, has had a very prosperous year. With an increase of 11.7 per cent. in the average mileage worked, it reports a gain of 17.6 per cent. in gross and 21.6 per cent. in net earnings. These increases were made in the face of a falling off in rates; the passenger rate was 5.6 per cent. less than the previous year, while the freight rate was 15.6 per cent. less, and the lowest ever known on the road. The passenger traffic grew in a remarkable way, the passenger mileage gaining 31.5 per cent., and the average passenger train load increasing one-eighth. The freight traffic was 37.2 per cent. greater than last year, and more than twice that of four years ago. The traffic seems to be more evenly distributed than last year, as is shown by the comparatively small increase in freight car mileage, and the large increase in the average freight train load. The year has been an excellent one for this, as for nearly all the Northwestern roads, and stockholders can find no cause for complaint when the company, after paying 10 per cent. dividends, can spend $1,128,672 in new work, and still have $825,307 to carry to surplus account, besides a large contribution from the land grant.

THE PITTSBURGH, FORT WAYNE & CHICAGO road, the backbone of the Pennsylvania Company's system west of Pittsburgh, shows for the calendar year 1879 a large increase both in gross and net earnings, though the net gain is a little less in proportion than the gross, owing to a considerable increase in working expenses. The report, a summary of which is given elsewhere, is made by the lessor company and does not give any statements of traffic. That was undoubtedly large, as indicated both by the gross earnings and the increase in expenses, and shown by the great gain given in the Pennsylvania Railroad Company's report for all lines west of Pittsburgh. The importance of this road to the lessee is shown by the fact that the net gain on the lease, after paying all interest and rentals, was $900,628, or, if we deduct the contribution to the sinking fund, $796,528, a very respectable sum indeed, and probably enough to meet the deficiency on the other leases of the company.

THE FAST TRAINS between the seaboard and Chicago are to continue for the present, it seems. A few days ago it was reported that they would be withdrawn, but it is so far from that being the case, that the Baltimore & Ohio announces a reduction in the time of its second west-bound train, making that also a fast train. The little squabble over the east-bound fast trains has been settled, and most of the roads west of Chicago have arranged their time-tables so as to bring their express trains to Chicago in time to connect with the fast lines eastward. On most of the roads east the present arrangement imposes the expense of an extra train, and probably without sufficient improvement in passenger traffic to warrant it. Nevertheless, each company must continue to run it as long as the others do, and each seems unwilling to be the first to give way.

Sanitary Superintendence of a Railroad.

The Chicago, St. Louis & New Orleans road runs through a country peculiarly subject to the visitation of epidemic diseases, especially the yellow fever, and its managers purpose taking all possible steps to prevent the spread of disease. To that end they have established a systematic sanitary superintendence over the line, as shown in the following order lately issued by General Manager James C. Clarke:

"In view of the earnest desire entertained by this company to use every available means within its reach to forestall and obviate the prevalence of contagious or infectious diseases along its line, and also of its wish, in the event of the existence of such diseases, to co-operate to the fullest extent with local state and National Health authorities, Dr. Henry Stone is hereby appointed Sanitary Inspector of this company's railroad, stations and station grounds, shops, etc., between East Cairo and New Orleans.

"Officers and agents of this company will co-operate and advise with him in all matters calculated to prevent and arrest the spread of any disease that may exist or originate on this railroad, or in the communities adjacent thereto.

"Dr. Stone will pass over this line, visiting from time to time as many places as his duties will permit.

"Superintendents and officers whose duty it is to operate the road, will, with Dr. Stone from time to time, confer and co-operate with all local and state boards of health and municipal authorities at the several points on this company's railroad, to aid them in preserving the general public health; and in the event of any quarantine regulations being found necessary, they will confer with the proper authorities, and arrange in the most practical way, to observe and maintain such restrictions as may be best calculated to secure the end in view.

"Dr. Stone will put himself in communication with the representatives of the National Board of Health in the states of Louisiana, Mississippi, Tennessee and Kentucky, and through the division superintendents of this company's railroad, carry out as far as practicable, the rules, recommendations and suggestions of the National Board of Health.

"By a proper co-operation with all authorities, such regulations may be adopted as will give all the security to the several localities that can be obtained, and at the same time offer the least inconvenience to passengers and freight, thereby greatly aiding in the successful operation of the railroad, so necessary to the people residing thereon, and communities adjacent thereto, during the prevalence of severe sickness or epidemics.

"From the activity and earnestness with which sanitary regulations are being enforced at all prominent points in the Mississippi Valley, we have reason to hope and believe that with the aid of the National Board of Health, we shall escape yellow fever and other infectious or contagious diseases during the present, and, we trust, in future years."

The Plattsmouth Bridge over the Missouri.

This structure is now being built across the Missouri River, about a mile below the city of Plattsmouth, Neb. It forms the connecting link between the Iowa and Nebraska divisions of the Chicago, Burlington & Quincy Railroad. The whole length of the work is about 3½ miles, of which more than two miles is in the east approach; one mile is in the west approach, and the permanent bridge is just 3,000 feet long.

The east approach consists of:

First. An embankment 1½ miles long. This is on the Iowa bottom-land, and is from five to 25 feet high. It is partly on a level and partly on a rising grade of 1 per cent. toward the bridge.

Second. A temporary wooden trestle, 2,000 feet long, in 100 spans of 20 feet each, also built on a 1 per cent. grade.

The west approach consists of:

First. A side-hill embankment, about one-half mile in length, crossing two small ravines drained by arched culverts.

Second. A cut, one-half mile long, ranging to 85 feet maximum depth. In the deepest part of the cut, a temporary line, with curves of 250 feet radius, has been adopted. The material lying between this and the permanent slope is to be used in filling the wooden trestle on the east approach.

The permanent bridge consists of two through spans of 400 feet each, over the main river; three deck spans of 200 feet each over the adjacent sand-bar, and 1,560 feet of iron viaduct, of which 1,440 feet, in 48 spans of 30 feet each, are on the east side.

The five main spans rest on six piers, numbered in order from the west shore, and briefly described as follows:

Pier one, on the west shore, is founded on the rock 30 feet below low-water mark. Excavation being made in an open coffer-dam, through blue clay and boulders. This coffer-dam was filled with béton and rubble stone, and masonry was begun at two feet below low-water.

Pier two, in the middle of the river, is founded on the rock 32½ feet below low-water, by sinking a pneumatic caisson 21 by 51 feet, through about 15 feet of sand. This caisson was surmounted by a timber crib-work, filled with béton, and masonry was begun at two feet below low water.

Pier three, on the east shore, is founded on the rock 52 feet below low water, in a similar way to pier two, the chief difference being the greater depth of sand lying on the bed-rock. Masonry was begun a little over six feet below low-water.

Piers one, two and three are of the same general form, and their tops finish at a height of 62 feet above low water. Under the coping courses, they measure 8 by 33 feet, the ends being semi-circles of four feet radius. They are built with a batter of one-half inch per foot on sides and ends. At 34 feet below the coping courses the ends are changed to a pointed form, the lines being arcs of circles struck from points seven feet apart. At the foot of the battered work the piers are 18 by 44 feet. Offset courses increase this size in the bases of piers two and three.

These three piers are of first-class rock-faced masonry, laid in Portland cement, and backed with béton.

Pier four is founded on the rock 54 feet below low water, by sinking a pneumatic caisson, 18 by 40 feet, through 65 feet of sand. The masonry of this pier begins one foot above low water, the intermediate height between it and the caisson being made up of a crib filled with béton.

Pier five rests upon 78 piles, driven inside of a curb, 18 by 40 feet, to an average penetration of 30 feet below low water. These piles are capped with a grillage, and surrounded, inside the curb, with béton, and the masonry is begun at low water.

Piers four and five measure 7 by 27 feet under the copings, have semi-circular ends, and are about 30 feet high. They are of first-class rock-faced masonry, with rubble backing, and are laid in Portland cement.

Pier six is founded on concrete three feet thick and 12 feet wide, by 33 feet long. The masonry is similar to that of piers four and five, but is only six feet thick under the coping.

Piers three, four, five and six, carry the three-deck spans. These are each 200 feet long between centres of end pins, 30 feet high, and 16 feet wide between centres of chords. They are Pratt trusses, with single intersection webs and inclined end posts, and have each eight panels of 25 feet. The floor-beams rest on the top chords, and the track stringers are riveted to the webs of the floor-beams. There is a grade of ½ per cent. on these spans, made by placing each span at a different elevation, the second and third being respectively one and two feet higher than the first span, and the grade in each span being made by varying the depth of the floor-beams on the chords. The third span rests in recesses left at the proper elevation in the masonry of pier three. The 200-feet spans are entirely of iron, except the pins, which are steel.

Piers one, two and three carry the two 400-feet spans. These are each 400 feet long between centres of end pins, 50 feet high and 22 feet between centres of chords. They are pin-connected Pratt or Whipple trusses, with inclined end posts, the web being arranged with double intersections. Each span has 16 panels of 25 feet. The ties are in two lengths, and couple on pins passing through the centres of the posts. Attached to these pins, a strut extends between each pair of posts, and a system of diagonal wind bracing connects these struts with the top lateral struts. The middle of each inclined end-post is supported by a horizontal lattice-work strut, which reaches to the first vertical post. The floor-beams are riveted to the posts immediately above the bottom chords, and act as lateral struts, the lateral ties being coupled on pins, passing through jaw-nuts, screwed on the ends of the lower chord pins. The stringers are riveted to the webs of the floor-beams.

In these trusses, the top and bottom chords, inclined end-posts, main and counter ties, lateral rods, pedestals, rollers, and all chord and lateral pins are of steel. The intermediate posts, end suspenders, lateral struts, portals, stringers and floor-beams are of iron.

The floor system is uniform on the iron viaduct and on the five spans. The track stringers are spaced nine feet between centres. On these rest 9 by 9 oak ties, spaced 15 inches apart, centres. These are generally 12 feet long, locked by 10 by 10 oak guard rails, placed on the ends of the ties. At five feet intervals, ties 16 feet long project, carrying a foot-walk of 2-inch oak plank on each side; and at 25 feet intervals 18 feet ties are inserted, to carry an iron stanchion, through which will pass a wire cable for a hand-rail. Between the rails are placed two 4 by 5 inch angle irons for inner guard rails, bolted to each tie, and distant six inches from each rail.

The contractors on the work have been as follows:

For earthwork on approaches, N. S. Young, of Burlington, Ia.

For construction of wooden trestle, Eaton, Young & Co.

For masonry on approaches, Jenkinson & Drexel, of Omaha, Neb.

For constructing and sinking of caissons for Piers 2, 3 and 4, Gen. W. Sooy Smith, of Maywood, Ill.

For béton work of all kinds, J. C. Goodridge, Jr., of New York city.

For masonry of piers, W. H. B. Stout, of Lincoln, Neb., succeeded by Reynolds, Saulspaugh & Co., of Rock Island, Ill.

For iron viaduct and 200 feet spans, Kellogg & Maurice, of Athens, Pa.

For manufacture of steel, Hussey, Howe & Co., of Pittsburgh, Pa.

For 400 feet spans, Keystone Bridge Co., of Pittsburgh, Pa.

The substructure and superstructure have been designed throughout by the Chief Engineer, George S. Morison, and the work has been executed under his direction, assisted by the following staff: H. W. Parkhurst, First Assistant Engineer; C. C. Schneider, Assistant Engineer of Superstructure; B. L. Crosby, Assistant Engineer, and W. G. Dilworth, Assistant Engineer.—*Engineering News.*

Railroad Sinks.

The sinking out of sight of several hundred feet of the New York, New Haven & Hartford Railroad near Meriden, Conn., a few days ago, and the statement in Connecticut newspapers that the incident was something heretofore unheard of in the construction of railroads in this country, has recalled several interesting incidents of difficulties encountered in building railroads over subterranean lakes in this vicinity during the past few years.

In 1870, when the Monticello & Port Jervis Railroad was being graded near Gilman's, it was noticed that the ground for several rods was moist and shaky. It required much filling to make a solid road-bed. A year afterward, the road having been in operation several months, the watchman of that section of the track was walking along the railroad just after the passenger train to Monticello had passed the spot. Suddenly he saw the railroad embankment gradually sinking for a long distance ahead of him. He ran to a high bank at the side of the road just as the railroad dropped with a loud noise, 15 feet below the surface. It required days of labor and the driving of long piles to construct a secure foundation for the rails.

The New Jersey Midland Railroad was constructed in 1870, through the northern part of New Jersey, and was graded over a marshy place between Snufftown and Fort Turtle. One night the laborers quit work, after several days' labor, having almost completed the work at that point. When they went to their task next morning they were amazed to see that where the road-bed had been was a pond of thick, muddy water, 600 feet long and 25 or 30 wide. The men attempted to sound the depth of the mysterious pond, but an iron rod 40 feet long failed to reach any foundation. The swampy flat where this phenomenon was witnessed was once heavily timbered, but a portion of it had been cleared and used for meadow land. Its surface was such, however, that a team could not be driven over it, and a person in walking across any of the meadows would cause the surface to shake for several feet around. Near by there are "boiling springs," so called from the manner in which the water gushes out of the earth. The water of these springs is of excellent quality, and never varies in volume, streams of moderate size being formed. If the stories of people living in the vicinity are true that curious-looking fish without eyes have been taken from these springs, the theory that a vast underground lake exists there, would seem to be proved beyond doubt. All the surroundings indicate that a natural pond or lake once covered the surface, but what should have transformed it into a subterranean body of water is the mystery. An examination of the spot was made at the time of the sinking of the railroad grading by several scientific men, and they were of the opinion that the lake had been incrusted by the accumulating vegetable matter of numberless ages, until a surface had formed sufficient to sustain forest growth. The boiling springs were regarded as outlets to the subterranean lake. Whether these speculations were based on truth or not, there was no doubt that the railroad had been submerged, and, as there was no thoroughfare for the road anywhere else in the vicinity, the gigantic task of making a substantial road-bed in the Snufftown Sink, as it was called, had to be accomplished or the railroad enterprise abandoned. Bottom was found at a depth of 90 feet. Nearly two months were occupied in overcoming the swallowing-up capacity of the sink. It was a week before any effect of the vast daily work of dumping thousands of cart-loads of gravel, hundreds of trees, rocks, etc., into the sink was noticeable. A solid bed was made, however, and no difficulty has ever been experienced from any settling of the track.

The Jefferson Branch of the Erie Railway was built in 1872-3. It is a coal-carrying road, and climbs the lofty hills of Northern Pennsylvania from Susquehanna to Carbondale. When it was in course of construction, the road-bed for a distance of a quarter of a mile disappeared one night. An apparently bottomless bog appeared in its place. Into this pit 10,000 cart-loads of gravel, and over 500 hemlock trees, branches and all, were thrown, without having any visible effect toward forming a bottom. A pile 40 feet long was then driven down its entire length. Upon it another one of the same length was placed and driven down, and still no bottom was found. Four of these long timbers were forced down, one on the other, before solid foundation was reached, proving that the bog, or lake, or sink, was 160 feet in depth. The existence of this curious formation at this spot was the more remarkable because it was on the summit of a ridge 2,000 feet above tide, and all around it were rocky hills and ledges. George S. Redington was then Superintendent of the Delaware Division of the Erie. He had a line of piles driven as above described along both sides of the space desired, on which to construct the road-bed. The piles were driven close together, and formed subterranean booms, that prevented the passage of anything thrown into the space. The trees were cut off of three acres of land, and a hill containing four acres of gravel was leveled to obtain material sufficient to make any kind of a foundation for the track. The filling of this great sink was probably one of the greatest tasks ever undertaken in railroad building in this country.

A curious instance of this kind occurred on the White Hall & Plattsburg Railroad, in 1872, near Crown Point. A number of laborers were engaged in repairing the road-bed, gravel being carried to them from a bed some distance away by a gravel train. The train had just unloaded at the spot where the men were working, and when the engineer started to return to the gravel-pit, he noticed something wrong with the rails. Upon examination, with the foreman, he found that the rails had moved several inches. They ran on some distance in order to see if the grade had changed any, when suddenly the track, with train and all, dropped with a crash a distance of 20 feet. The fireman was alone on the engine, the engineer and foreman having alighted to examine the track just before the sink occurred. He was assisted to the surface as the banks on either side began to cave in upon the locomotive, which was buried a half minute later. The earth on all sides opened in large fissures, 4 to 6 feet wide and 50 feet deep, and the surface of the earth for 300 feet was changed into a series of hummocks and gullies.

The phenomena of the incrustation of sheets of water, which, in the lapse of time, became solid earth apparently, forms an interesting subject for scientific investigation. The process of this incrustation may be witnessed at Amber Lake, in the town of Bethel, Sullivan County. A large portion of the shores of that delightful little sheet of water is a floating morass, which, near the waters's edge, is too thin to sustain the weight of a grown person, but seems firm and solid as the shore is approached. The work of covering the water with vegetable matter goes steadily although slowly on, as all the surroundings plainly attest.—*Port Jervis Correspondent New York Times.*

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings.

Meetings will be held as follows:

Metropolitan Elevated, annual meeting, at the office in New York, July 8, at noon.

Morris & Essex, annual meeting, at the office in Hoboken, N. J., July 7, at 11 a. m.

Dividends.

Dividends have been declared as follows:

Union Pacific, 1½ per cent., quarterly, payable July 1.

Philadelphia, Wilmington & Baltimore, 4 per cent., semi-annual, payable July 6.

Foreclosure Sales.

The Purchasing Committee, who bought the property of the *New York, West Shore & Chicago Company* for the bondholders at foreclosure sale, will, under instructions from the said bondholders, offer the same at public sale in New York, July 13. The property will be sold just as received from the Court, subject to certain liens for taxes, etc., and also to the conditions of an agreement made with certain bondholders in January, 1879. The property includes no finished road.

Southwestern Railway Association.

The regular monthly meeting was held in Chicago, June 16. There were present J. C. McMullin and James Smith, Chicago & Alton; T. J. Potter and E. P. Ripley, Chicago, Burlington & Quincy; R. R. Cable and J. G. Sanford, Chicago, Rock Island & Pacific; W. H. McDoel, Hannibal & St. Joseph; J. T. Barnard and J. E. Smith, Kansas City, St. Joseph & Council Bluffs; A. A. Talmadge and J. A. Hill, Missouri Pacific; M. Knight, Wabash, St. Louis & Pacific; George L. Carman, General Agent of the Association at Kansas City; E. O. Hudson, General Agent at St. Louis; and J. W. Midgley, Commissioner. Mr. J. C. McMullin presided, and Commissioner Midgley acted as Secretary.

Mr. J. C. Gault, General Manager of the Wabash, St. Louis & Pacific, sent dispatches regretting his inability to be present at the meeting, and requesting an adjournment until next week. Mr. A. C. Bird, General Freight Agent of this road, was also prevented from being present on account of sickness. Mr. J. D. Carson, General Manager of the Hannibal & St. Joseph, was in New York. Owing to the absence of these gentlemen, it was decided to defer action on all the important issues, especially the readjustment of the percentages of the roads in the Chicago Division, until Friday, June 25.

A new Executive Committee of five was elected to serve until the end of the calendar year. The new Committee is as follows: J. C. McMullin, John C. Gault, A. A. Talmadge, R. R. Cable and T. J. Potter. Subsequently the Committee elected Mr. J. C. McMullin Chairman. The statement was made that there was considerable trouble regarding the equalization of rates from interior points in Indiana, Michigan and Ohio, as the Southwestern roads did not know the rates made by the Eastern lines. It was suggested that the only way to adjust these differences and secure uniform rates via all routes was to charge local or arbitrary rates from Mississippi River points to Missouri River points and beyond on all business coming from pro-rating points east of Chicago and St. Louis. In accordance with this suggestion it was decided to enforce on all such business uniform arbitrary rates from all Mississippi River points, making the rates the same from all those points. This will have the effect of confining all difficulties regarding that business to the territory east of the Mississippi.

A statement was also made that the rates on salt, cement plaster and hard coal from Buffalo were in a very confused and disturbed condition. Commissioner Midgley was authorized to call a meeting of all the roads interested in this business to adjust the differences. The meeting then adjourned. Subsequently the General Freight Agents of the various lines in the Association held a meeting and made sundry changes in the classification.

Railway Employes' Mutual Benefit Association of the West.

The tenth annual meeting of this Association was held in Cincinnati, June 9, with a large attendance. The Association was reported in a very prosperous condition.

Besides the usual routine work the only business of importance was the introduction of the following resolution, which was unanimously adopted, and will be strictly enforced:

"*Resolved*, That the time of paying assessments be limited to the month following the month within which the notices are dated by the General Secretary.

"That the General Secretary be instructed to date his assessments on the 25th of each month, and to send out the same on or before the same date.

"That all representatives and members be notified that this resolution takes effect on the issuance of June notices, and that this resolution be presented in connection with the report of the Committee on By-laws and Constitution at the next annual meeting, or as a substitute for such portion of that report as may refer to the matter of time limitations in paying assessments."

ELECTIONS AND APPOINTMENTS.

Atlanta & Charlotte Air-Line.—The following circular is dated June 15: "Mr. and Mrs. C. A. Biedermann, of Mount Airy, Ga., have this day been appointed agents of this company, to represent it in the capacity of Immigrant Agents in Europe, with headquarters at Zurich, Switzerland.

"Mr. and Mrs. Biedermann will sail about the 20th of July. Any one having relatives or friends in that country, who may desire their services in conducting them to this country as settlers, can confer with them for the next twenty days at Mount Airy, Ga.

"These agents are vested with authority to apply emigrant rates direct from Europe to any point on the Atlanta & Charlotte Air-Line Railway, and to represent the company in disposition of the lands entered upon their Land Registry."

Baltimore & Delta.—At the annual meeting in Baltimore, June 21, the following directors were chosen: J. C. Neilson, James H. Price, Thomas A. Hays, John A. Janney, Stephenson Archer, George L. Van Bibber, John Carroll Walsh, E. S. Rogers, W. H. Waters, Harford County, Md.. Robert Gilmor, Wm. Gilmor, F. C. Fossett, S. G. Boyd, A. H. Hobbs, Wm. Young, E. J. Chaisty, R. A. Dobbin, Baltimore County, Md.; P. T. George, Caleb S. Taylor, John S. Gittings, R. R. Boarman, Baltimore.

Boston, Hoosac Tunnel & Western.—The directors of this company as consolidated are: Elisha Atkins, Wm. L. Burt, F. Gordon Dexter, J. W. Candler, J. R. Brewer, John B. Alley, A. A. Gaddis, Boston; F. L. Ames, Oliver Ames, South Easton, Mass.; George R. Blanchard, George J. Post, New York; S. S. Guthrie, Buffalo, N. Y.; Coe F. Young, Honesdale, Pa. The officers are: President, F. L. Ames; Vice-President, John R. Brewer; Secretary, Thomas Voorhees; Treasurer, Estes Howe.

Ft. Wayne & Terre Haute.—At the annual meeting in Ft. Wayne, Ind., June 16, the following directors were chosen: Alexander H. Bayless, R. C. Bell, Edwin Evans, Mont. Hamilton, J. T. Hanna, H. C. Hartman, Thomas B. Hedekin, Wm. H. Jones, R. T. McDonald, Charles F. Muhler, George W. Pixley, A. C. Trentman, F. H. Walke. The board elected Edwin Evans President and Chief Engineer; Thomas B. Hedekin, Vice-President; Wm. H. Jones, Secretary; F. H. Walke, Treasurer.

Lehigh Valley.—Mr. James Donnelly has been appointed Assistant Superintendent of the New Jersey Division.

Memphis & Charleston.—Col. E. W. Cole has been chosen Vice-President, in place of Mr. C. M. McGhee, resigned.

New York, Lake Erie & Western.—The following are recent appointments in the Freight Department: E. T. Low, Assistant General Freight Agent, in charge of local traffic; Edward Foley, Assistant General Freight Agent, in charge of through traffic; A. H. Ward, General Eastern Agent, in charge of through westward traffic, office No. 401 Broadway, New York: E. T. Hopkins, Foreign Freight Agent, in charge of foreign traffic, office No. 3 Bowling Green, New York; C. C. Winans, New York, Traveling Freight Agent.

Ogdensburg & Lake Champlain.—At the annual meeting in Ogdensburg, N. Y., June 16, the following directors were chosen: John Q. Adams, N. Cushing, H. R. Duval, J. H. Farrar, S. M. Felton, N. Fish, W. L. Frost, Edward H. Harriman, W. A. Haskell, D. W. Lawrence, J. W. Osborne, E. B. Phillips, N. J. Rust.

Railway Employés Mutual Benefit Association of the West.—At the recent annual meeting in Cincinnati the following officers were chosen: President, James R. Wood, Chicago, Burlington & Quincy; Vice-President, E. M. Whitlock, Cleveland & Pittsburgh; Secretary, Henry B. Maxwell, Chicago, Burlington & Quincy; Treasurer, Thos. C. Hatch, Chicago, Milwaukee & St. St. Paul,

Rochester & State Line.—The New York Supreme Court has appointed W. H. Crennell Receiver, in the suit brought by the Attorney General of New York.

Rome & Clinton.—At the annual meeting in Rome, N. Y., June 16, the following directors were chosen: E. B. Armstrong, B. J. Beach, Alfred Etheridge, G. V. Selden, W. S. Bartlett, J. E. Elliott, A. W. Mills, E. S. Williams, George B. Phelps, L. H. Shattuck, I. J. Scollard, E. Huntington,

I. R. Miller. The board elected W. S. Bartlett President; E. B. Armstrong, Vice-President; A. W. Mills, Secretary and Treasurer. The road is worked by the Delaware, Lackawanna & Western.

St. Louis, Iron Mountain & Southern.—The following circular is dated June 17: "Mr. Decatur Axtell having resigned the position of Superintendent of the Missouri Division, Mr. William Kerrigan is appointed to fill the vacancy, and will assume the duties on and after July 1."

St. Paul & Duluth.—At the annual meeting in St. Paul Minn., June 21, the following directors were chosen: John F. Ilsley, William H. Rhawn, Peter Geddes, Alexander Mitchell, David Dows, R. P. Flower, James Smith, Jr., John Q. Adams, Charles H. Graves. The only new director is Alexander Mitchell (President of the Chicago, Milwaukee & St. Paul), who succeeds Jeremiah Milbank.

St. Paul, Minneapolis & Manitoba.—The following circular is dated June 15:

"A. B. Stickney has this day been appointed Superintendent of Construction, and will assume the duties pertaining thereto at once. He will have charge for this company of all construction for new lines, and will direct the disposition of men and material in connection therewith."

Mr. Stickney was formerly General Superintendent of the St. Paul, Stillwater & Taylors Falls road.

Wisconsin Valley.—At the annual meeting in Tomah, Wis., recently, the following directors were chosen: Thomas B. Scott, Grand Rapids, Wis.; James F. Joy, Detroit, Mich.; W. J. Rotch, New Bedford, Mass.; F. Bartlett, Sidney Bartlett, John A. Burnham, J. N. Denison, H. H. Hunnewell, Charles Merriam, Nathaniel Thayer, Nathaniel Thayer, Jr., Boston.

PERSONAL.

—Mr. David L. Phillips, an old citizen of Illinois, and a prominent editor and politician of that state, died in Springfield, June 19. He was for a time in the employ of the Illinois Central, and in 1858 organized the Belleville & Southern Illinois Company, of which he remained President until his death.

—Mr. Theodore N. Ely, Superintendent of Motive Power of the Pennsylvania Railroad, has sustained a severe loss in the death of his wife, Mrs. Henrietta Brandes Ely, who passed away, from her home in Altoona, June 13. Mrs. Ely was highly esteemed, and her death was felt almost as a public loss. She was a daughter of Dr. Charles Brandes, of Erie, Pa., and her funeral took place in that city June 17, and was very largely attended.

—Hon. Benjamin Fish, probably the oldest railroad director in the United States, died suddenly at his home in Trenton, N. J., June 22, in the 95th year of his age. More than 70 years ago he was engaged in the transportation business, having wagons running between South Amboy or Elizabethtown Point and Bordentown, and during the war of 1812 he had a heavy contract for carrying government stores between New York and Philadelphia. When the Camden & Amboy Railroad Company was organized in 1830 he was chosen a director and has ever since—for 50 years—been a director of that company and its successor, the United New Jersey. For many years he was very active in the management, and he continued to take an active part in business until the time of his death, being able to do as much work as many men of 60 years.

—Col. Thomas A. Scott was recently waited upon at his residence by a committee of five locomotive engineers, who presented him with the following letter, handsomely engrossed and framed:

"*Col. Thomas A. Scott, Philadelphia, Pa.*—Dear Sir: As embodying the feeling of the engineers of the Pittsburgh Division of the Pennsylvania Railroad, at your retirement from the presidency of the company, the undersigned, a committee appointed in their behalf, beg leave to assure you of the deep regret with which they have heard of the termination of your active and official connection with the road. This feeling is due, doubtless, to the fact that from the time the Pennsylvania Railroad was conceived to the present—all through the period of your great labors for its advancement—you have ever been watchful of the interest of its employés. Accept, then, this expression of our regret at your retirement, coming as it does from those who sincerely wish you well to the end."

TRAFFIC AND EARNINGS.

Grain Movement.

For the week ending June 12 receipts and shipments of grain of all kinds at the eight reporting Northwestern markets and receipts at the seven Atlantic ports have been, in bushels, for the past seven years:

Year.	Northwestern Receipts.	Northwestern Shipments.—Total.	By rail.	P. c. by rail.	Atlantic Receipts.
1874.....	4,217,324	4,089,948	739,787	18.1	4,596,355
1875.....	2,490,349	2,518,909	1,084,679	43.1	2,879,202
1876	5,991,926	5,313,216	2,394,811	45.1	5,123,251
1877.....	2,076,791	2,166,457	664,033	30.6	1,656,278
1878.....	2,660,004	3,576,261	778,483	21.9	4,984,836
1879.....	4,773,299	5,002,852	2,706,245	54.0	6,065,502
1880.....	5,754,274	6,991,823	1,727,629	24.7	7,633,849

The Northwestern receipts, though exceeded but once in the corresponding week for seven years, were much smaller than in the preceding week. Northwestern shipments were also less than in the preceding week, but Atlantic receipts were considerably larger—greater than in any other week of this year.

Exports reported from the seven Atlantic ports for the week ending June 19, were 90,044 barrels flour, 3,196,549 bushels wheat, and 3,299,693 bushels corn.

Coal Movement.

Coal tonnages for the week ending June 12 are reported as follows:

	1880.	1879.	Inc. or Dec.	P. c.
Anthracite.....	401,277	560,112	D. 158,835	28.4
Semi-bituminous.....	93,492	80,801	I. 12,691	15.7
Bituminous, Penna.....	32,365	39,693	D. 7,328	18.5
Coke, Pennsylvania....	28,392	16,803	I. 11,589	69.0

It is very probable that the anthracite companies will agree to shut down for two weeks in July.

Coal shipments from Seattle, Wash. Ter., in May were 13,411 tons. For the five months ending May 31 they were: 1880, 52,381; 1879, 62,730; decrease, 10,349 tons, or 16.5 per cent. Traffic this year was interrupted several weeks by a heavy land-slide on the Seattle & Walla Walla road, which brings down all the coal.

Chicago Lumber Traffic.

Chicago lumber receipts this year to June 8 were as follows:

	1880.	1879.	Inc. or Dec.	P. c.
Lumber, feet.....	339,323,000	339,131,000	I. 192,000	0.06
Shingles, No..	164,065,000	190,307,000	D. 26,242,000	13.79

Of the lumber, 16.2 per cent. came by rail, and 83.8 per cent. by lake. Of the shingles, 82.1 per cent. were received by lake, and 17.9 per cent. by rail. There was a considerable decrease in receipts of shingles, while those of lumber show very little change. The proportion of lake to rail receipts shows a decrease this year.

Railroad Earnings.

Earnings for various periods are reported as follows:

	1880.	1879.	Inc. or Dec.	P. c.
Five months ending May 31:				
Cairo & St. Louis..	$144,511	$92,451	I. $52,060	56.3
Chicago, St. Paul & Minn.....	577,329	453,753	I. 123,576	27.2
Denver, So. Park & P	940,789	180,309	I. 760,480	421.8
Detroit, Lansing & No.....	466,471	388,074	I. 78,397	22.0
Kan. City, Ft. Scott & Gulf.....	447,437	313,814	I. 133.623	42.6
Memphis, Paducah & No.....	81,442	62,099	I. 19,343	31.1
Paducah & E'town	149,016	108,312	I. 40,704	37.6
Pennsylvania.	16,212,596	13,023,249	I. 3,189,347	24.5
Net earnings.	7,081,902	5,244,661	I. 1,837,301	35.0
Peoria, Decatur & Evan...	167,412	.....	....	.....
Three months ending May 31:				
Lake Erie & Western.....	$253,758	$143,033	I. $110,725	77.4
Month of May:				
Cairo & St. Louis..	$34,683	$18,902	I. $15,781	83.5
Denver, So. Park & P.....	223,903	44,354	I. 179,549	404.4
Detroit, Lansing & No.....	91,092	91,527	D. 435	0.5
Kan. City, Ft. Scott & Gulf.....	80,192	72,338	I. 7,854	10.9
Lake Erie & Western.....	100,630	45,434	I. 55,196	121.6
Mem., Paducah & No..... ...	13,338	11,271	I. 2,067	18.3
Paducah & E'town	27,812	19,405	I. 8,407	43.3
Pennsylvania..... ..	3,417,915	2,708,694	I. 709,221	26.2
Net earnings.	1,476,851	1,034,091	I. 442,760	42.8
Peoria, Decatur & Evansv.....	40,800	.....	....	
First Week in June:				
Minn. & St. Louis..	$14,230	$7,353	I. $6,877	93.0
Second week in June:				
Chicago & Eastern Ill.....	$19,843	$15,748	I. $4,095	26.0
Chicago, Mil. & St. Paul.....	278,000	183,334	I. 94,666	51.6
St. Lo., Iron Mt. & So.....	92,000	81,683	I. 10,317	12.6
Wabash, St. Lo. & P.....	221,229	124,096	I. 97,133	78.3
Third week in June:				
Denver & Rio Grande.....	$72,335	$25,237	I. $47,098	186.9
Week ending June 4:				
Great Western.....	$94,330	$71,221	I. $23,109	32.5
Week ending June 12:				
Grand Trunk.....	$193,676	$148,816	I. $44,860	30.2

East-Bound Freight Division.

At a meeting held in Chicago, June 17, to settle the allotment of east-bound freight from Chicago which should be made to the Grand Trunk, that company claimed 20 per cent., while the others were willing to allow only 7 per cent. After long discussion no agreement was reached, and the decision was left to the Board of Arbitration.

Southwestern Railway Association Rates.

From June 21 the roads in this Association will charge on business originating at pro-rating points east of the Mississippi River and Chicago—except seaboard points—and destined to or through the four Missouri River points, the following arbitraries, (from St. Louis, Louisiana, Hannibal, West Quincy, Burlington or Davenport to St. Joseph, Atchison, Leavenworth or Kansas City), in cents per 100 lbs.:

1st class.	2d class.	3d class.	4th class.	Special.	Class A.	Class B.	Class C.	Salt, cement or plaster per barrel.
65	50	35	25	20	25	20	15	35

On local business originating at Chicago, Kenosha, Racine or Milwaukee the rates of tariff No. 32, of May 1, from Chicago will govern. The same tariff will also continue on local business from Toledo or Peoria.

On business from seaboard points the arbitraries of Circular No. 27, dated Feb. 2, 1880, will continue to apply.

Steam Canal Line.

The Buffalo *Commercial Advertiser* of June 19 says: "Since 1872 steam has gradually been working its way on to the Erie Canal. The obstacles to be overcome were almost insurmountable, but the necessities of the case and the inducements held out in the way of a lucrative business, if the experiments were successful, inspired enterprising men to continue their investigations. Hitherto their efforts to effect the introduction of steam on the canals have been of an individual character, and chiefly by men of very limited means.

"But their experiments were of such a satisfactory nature that we are glad to be able to state that organization and capital have at last been enlisted in the work. A company has been fully organized under the laws of this state under the name of the Canal & Lake Steamboat Company. The company is financially strong, and, should the present venture prove as satisfactory as anticipated, funds for placing a numerous fleet of steamers in operation will be forthcoming. The company has already constructed, or have in process of construction, ten first-class full-sized steamer canal-boats. Seven of them will be built at Ithaca by B. F. Tabor, and three by C. R. Tabor at Tonawanda. The engines will be of the style known as the compound-condenser, five of which will be built at Newark, N. J., and five by George W. Tifft, Sons & Co., of this city.

"Three of these steamers, the *Neptune*, *Venus* and *Mars* are already in commission and the *Jupiter* starts to-day. *The Castor* and *Pollux* will be out next week, while the *Saturn*, *Olytie*, *Ceres* and *Hebe* will be in commission by the middle of July. As the names of the steamers would indicate they will be known as the Planet Line. Mr. Wm. A. Thompson of Newark, N. J., is President, and experienced canal men will be called to fill the subordinate positions.

"The Planet Line is entirely independent of all lake propeller lines and will confine itself to a strictly canal business, taking grain East and returning West with merchandise, coal, etc. It will not attempt to make through rates, but will take the going freight on grain here and will bring back merchandise for the shipper or propeller line that will pay best for the service rendered. It is believed that these steamers will be able to secure better rates out of New York than are now paid to horse-boats for the reason that quicker despatch will be given and steamers will move with greater regularity. In short the despatch will be about as good as that usually given by freight trains. As far as grain freights are concerned experience has demonstrated that on the average the local rate from Buffalo to the East is better than the proportion allowed on the through rate."

Colorado Passenger Rates.

A meeting was held in Chicago, June 15, to consider the disturbed condition of passenger rates to Colorado and other points west of the Missouri River. Charges had been made that the parties to the existing agreement had not lived up to its provisions.

The roads represented were the Chicago & Alton; Chicago & Northwestern; Illinois Central; Chicago, Burlington & Quincy; Chicago, Rock Island & Pacific, and the Chicago, Milwaukee & St. Paul.

After much discussion over the alleged violation of the agreement, the Rock Island Company gave notice that it would withdraw from the agreement. The meeting then adjourned.

THE SCRAP HEAP.

Railroad Equipment Notes.

The Rhode Island Locomotive Works at Providence have just delivered a heavy passenger engine to the Boston & Providence road. They have orders enough to keep them busy for several months yet.

The Rogers Locomotive Works, at Paterson, N. J., have just completed eight engines for the New York, Woodhaven & Rockaway road.

The Manchester Locomotive Works, at Manchester, N. H., have a number of orders on hand, including one for three heavy engines for the Boston & Maine road.

The Chaplin Anti-friction Car Box Co. has offered to build a large factory at New Haven, Conn., provided a certain amount of stock is taken in that city.

There have been 18 locomotives shipped from the shops during the 17 working days of this month. Among them were included one for a Florida road with a name so interminable that the engine was scarcely long enough to accommodate the inscription; several for the New York, Woodhaven & Rockaway, also two for the Wabash, St. Louis & Pacific—all from Rogers'; several for the Cairo & Vincennes road, from Grant's, and several for the International Railway, Canada, and for the Canada Central Railway, from Danforth's. Work at the shops continues brisk, and the prospect encouraging.—*Paterson (N. J.) Press, June 19.*

The car-shops of Osgood Bradley, at Worcester, Mass., are building 10 new passenger cars for the Eastern Railroad.

The Grand Trunk shops, at Point St. Charles, Montreal are building several dining cars, to be used on the through express trains of that road.

The Cobourg Car Works, at Cobourg, Ont., are building several open excursion cars and 100 box freight cars for the Quebec, Montreal, Ottawa & Occidental road.

The Pennsylvania Railroad shops, at Altoona, have lately built six passenger engines for the West Jersey road.

Iron and Manufacturing Notes.

Plumb, Burdict & Barnard, of Buffalo, N. Y., have just set up bolt-forging machines at the works of the Singer Manufacturing Co.; at the pump works of W. & B. Douglas, and at the shops of the Richmond & Danville Railroad in Richmond, Va.

The Kansas Rolling Mill, at Rosedale, Kan., during May turned out 1,900 gross tons of rails; 550 gross tons of splice-bars, and 263 net tons of spikes. The mill is running full time and employs 400 hands.

The Gloucester Iron Works, at Gloucester, N. J., have the contract for furnishing the pipe and castings for the high water service in East Boston.

The furnace of the Warwick Iron Co., at Pottstown, Pa., has gone out of blast.

The Midvale Steel Works at Nicetown, in Philadelphia, are to be sold under order of Court by the Fidelity Trust Co., trustee under a mortgage made to secure an issue of $500,000 bonds. The date of the sale has not been fixed.

The Pittsburgh Steel Casting Co. have become so familiar with the casting of large and otherwise difficult steel castings, that they hardly appreciate the wonder and delight they give to a spectator who is permitted to witness, as we were allowed to do last Tuesday, the casting of a pipe of 14 in. in diameter, 16 ft. long, and of an average thickness of 2 in. Weight, 4,500 pounds. The material, crucible cast steel; 54 pots full to fill the mold. The floor work of general castings that received the remainder of what was melted the same afternoon, together with the unused ladle capacity, and the fact that a number of crucible holes were not called into use, told beyond a doubt that a five or six ton casting of steel could as well and as easily be cast by such disciplined workmen as the piece then in hand; the regular floor work in addition, of course. The large crane ladle, with its two stopper-like valves in the bottom, and operated by levers attached, for the rapid, but not damaging discharge of the molten steel, is a convenience not to be seen in an ordinary iron foundry.—*Pittsburgh Manufacturer.*

A new rolling mill is to be built at Chester, Pa., especially for the manufacture of steel-faced iron rails.

The San Francisco *Mining and Scientific Press* says: "The first iron blast furnace in California is now in course of construction at the Clipper Gap Iron Mountain, on the Central Pacific Railroad, 182 miles east of San Francisco. At this point there is an abundance of hematite and magnetic ores, and an almost inexhaustible supply of wood fuel and limestone convenient for flux. Including all contingencies, $12 (per ton) will cover the cost of pig metal worth $30 at least. This place is destined to be a great iron centre. * * We are informed that a furnace is contemplated at Port Townsend, Puget Sound, Washington Territory. Near navigable waters is a vast expanse of very rich bog ore, practically inexhaustible. Iron and magnetic ores abound, as does timber for charcoal."

Dunbar Furnace, in Fayette Co., Pa., is to have a new blowing engine put in.

A new partnership, to run the Weimer Machine Works at Lebanon, Pa., has been formed and began business June 1. The new company will consist of P. L. Weimer, L. E. Weimer, Elizabeth Weimer, Weimer Sands and Asa P. Weimer. Car building will again be taken up, and the car department, which has been lying idle for several years, will soon be in active operation, which, together with the heavy furnace orders on hand, will make matters lively at the old works.

Bridge Notes.

Sealed proposals will be received by the Trustees of the New York & Brooklyn (East River) Bridge, at their office, No. 21 Water street, Brooklyn, N. Y., until July 12, for making and erecting three wrought-iron street bridges in the Brooklyn approach to the main bridge. These bridges will be 100 ft. width, and the spans will be 61 ft. 6 in., 75 ft. 6 in., and 78 ft. Also for one bridge, of iron or steel, over Franklin Square, in the New York approach. Plans, specifications, etc., may be seen at the Engineer's office.

Rust & Coolidge, of Chicago, engineers and contractors, are now working on bridges for the Hot Springs Railroad in Arkansas; the Chicago, Rock Island & Pacific Railroad, in Iowa; and a large amount of roof work for the Chicago & Western Indiana Railway. They are also building several bridges for the Minnesota & Wisconsin Railway, in Wisconsin.

The Keystone Bridge Co., of Pittsburgh, has taken the contract for a new double-track iron bridge over the Monongahela at Pittsburgh, for the Pittsburgh, Cincinnati & St. Louis road.

Prices of Rails.

Steel rails are somewhat firmer and sales are reported at $62.50 to $65 per ton at mill for summer and fall delivery and $60 for later orders. There is some talk of lower prices, but no actual sales below $60 are reported.

Iron rails are more active, but prices are somewhat lower under the expectation that large lots of foreign rails will be thrown on the market. Quotations are $45 to $47 per ton at mill. One sale of 3,000 tons is reported at $45.

Old iron rails are dull and heavy. Philadelphia quotations are $25 to $26 per ton, with light sales.

Pittsburgh quotations for spikes are 2½ to 2¾ cents per pound, 30 days' time. Track bolts are quoted at 3½ cents per pound, and fish-plates 2 cents.

Gorges.

A man inquired of Ticket Agent Sammis at the depot this morning if he did not have some shop-worn or second-hand tickets that he could sell cheaper.—*Bridgeport (Conn.) Standard.*

An engine recently placed on the Rockville Branch Railroad has a pilot on the rear of the tender. The speed on this branch is notoriously deliberate and thoughtful, yet this placing of the pilot at the rear must be attributed only to unnecessary apprehensions on the part of the engineer that his engine can't keep out of the way of Tolland County cows.—*Hartford (Conn.) Courant.*

It is said that the deepest gorge in the world has been discovered in Colorado. We always had the impression that the biggest gorge in this country might be witnessed at a railway station where the train stops "five minutes for dinner."—*Norristown Herald.*

Do you want a through ticket? A man who firmly believes that a second flood will come next November to cover the whole face of the earth is building an ark at Helena, Ark. The craft will hold 50 persons, with food for 40 days and 40 nights, and he will take passengers at $500 each. Every other vessel, he explains, will be wrecked.

The Big Man Did It.

Some weeks since, while a party of Detroit surveyers were running a railroad line down in Indiana the survey carried them across a cemetery. In the course of the survey a small stake was driven into a grave, and before it was removed and carried ahead, a lathy, long-legged Hoosier overhauled the men, peeled off his coat and danced around as he yelled out: "Show me the man who dared drive that stake in that grave!"

"We are going to remove it," quietly replied one of the party.

"I don't care if you are; show me the man!"

"Well, I'm the man, and what are you going to do about it?" said the big man of the lot as he stepped out.

"Didn't you know that was my wife's grave?" asked the Hoosier with a considerable fall of his voice.

"No, sir."

"Well it is, sir—my first wife's grave."

"And what of that?"

"What of that! Why—why, sir, if I hadn't married a second one about a month ago and kinder forgot my grief, I'd take that stake and pin you to the fence with it! It's lucky for you fellers, mighty lucky for you, that I don't feel as bad as I did."—*Detroit Free Press.*

An English Bridge Accident.

English bridges break down sometimes in spite of their boasts of the superior strength of their structures. A dispatch from London, June 18, says: "A bridge on the Hereford, Hay & Brecon Railway, a small branch line in Herefordshire, broke down under the weight of a goods train this morning, precipitating the train into the river and killing the engine driver. The presumption generally entertained is that the bridge had been weak for some time."

It Was the Cat.

Down at Howell, the other day, an old woman about seventy years old, boarded a Detroit, Lansing & Northern train to come to this city. Her baggage consisted of a large covered basket, and she wouldn't allow any hand to take it from her. She had scarcely got seated when the passengers were startled by a loud "Me-ow!" in the car, quickly followed by a "per-wow" and other "wows" too numerous to mention. While all were searching to discover the cat, the old lady sat as stiff as a poker and looked straight ahead at the stovepipe. The sounds continued, and a passenger finally peered around until he located the cat in her basket.

"Madam, are you taking that cat from one county to another?" he asked.

"What cat?" she snapped.

"Don't you know that under the laws of this state," he went on, "a person who removes a full grown cat from one county to another, without the written permission of the Swamp Land Commissioners, is liable to a fine of $100?"

"Good lands! but I didn't know that!" she exclaimed, as she faced around.

"Women don't keep track of the laws as men do," he said. "Personally, I'd like to see you take that cat through to Detroit, but there may be some one on this train just mean enough to inform against you and have you arrested. I'd let her out if I were you."

"Yes, I will, for I don't want to break any law, at my age."

She fumbled around the basket for a minute, and all of a sudden the cat jumped out. She alighted on the head of the man who put up the job, gave him several sharp digs, and then leaped from one to another like a squirrel, biting, spitting and clawing as she went. Everybody rose up and yelled—everybody but the old woman. She sat like a statue, afraid of being suspected. When the feline had gone the length of the car, she turned to an open window and shot out like a bullet, landing right side up, and making tracks for a barn in a field.

"Who brought that cat aboard? I demand the name of the person who owned that cat!" shouted a man whose head had felt her claws until the blood run.

No one answered. Several passengers looked straight at the old woman, who stood it for a minute, and then lifted up her basket and called out:

"If anybody wants to look among the dried peaches in this basket for cats he can do so, you needn't all look at me as if I lived in the woods and didn't keep posted on law!"—*Detroit Free Press.*

Expediting Passage Through Canal Locks.

It is known to few not directly engaged in canal navigation that the canal officials have been devoting considerable attention to the subject of rapid transit through the locks of late, and that some interesting and highly successful experiments have been made. How necessary it is that some plan should be devised to reduce the detention at the locks to the minimum will be seen from a few facts. There are 72 locks on the line of the Erie Canal. Loaded boats are detained at each of these locks from ten to twenty minutes, according to the luck each has in making a good entry into the chamber, and the skill of the lock-tenders. If we make the average fifteen minutes, which is not wide of the mark, it will be seen that the delay at the locks during each trip is 72 quarter-hours, or three-quarters of a day. There are about 4,000 boats navigating the canals and they make at least seven trips each a season. It is plain, therefore, that an immense amount of time is lost at the locks each year.

In discussing this subject Mr. Porter, Engineer for the Middle Division, expressed the opinion that he could perfect machinery that would greatly expedite the passage of boats, and finally received authority from the Department to make a trial. The Port Byron lock, which is the worst on the entire line of the Erie, was selected, and last week the machinery was put in position and got ready for work. The plan is to utilize the waste water, so that the working of the machinery will be attended with comparatively little expense and no loss of water. Between each pair of locks is a flume, through which the water passes from one level to that below. In this flume an improved water-wheel is placed, which connects by means of heavy gearing with a shaft on the surface, running from the head of one lock to that of the other. On both ends of this shaft, about six feet from the lock, are friction wheels, by which the power applied to the tow line is regulated by an attendant. When the bow of a boat appears at the lower end of the lock a line is attached to her and passed around a drum-pulley on the outer end of the shaft. The water is then turned on and pressure applied to the friction-wheel, gently at first until the boat begins to move, and then stronger until the vessel is drawn into the lock at as great a rate of speed as she could be towed by horses on the open canal.

The machinery has been in operation now for eight or ten days, and last week a representative of the *Commercial* closely examined it. The results already attained justify us in saying that it is a complete success. It will pull a loaded boat into the lock in 2½ minutes, and after the lock-tenders become more accustomed to operating it this time will probably be cut down. As yet it is only used to draw boats into the lock, but it is Mr. Porter's intention to adjust it so that it can be used to as good advantage in pulling boats out of the lock as in drawing them in. Another excellent feature of Mr. Porter's invention is that it is comparatively inexpensive. The entire cost of fitting up the Port Byron lock with this power was about $800. The canal authorities should lose no time in providing the Jordan lock and those at Syracuse with this machinery. These five are the only locks on the entire line of the Erie in which loaded boats going East are lifted. These should be furnished with power at once, and the other single locks as rapidly as possible. A small amount of money could not be expended for a better purpose than this on the canals.—*Buffalo Commercial Advertiser.*

Fast Time.

The daylight express on the Ohio & Mississippi road made the run recently from Mitchell to Seymour, a distance of 40 miles, in 49 minutes. From Seymour to Cincinnati, distance 87 miles, was run in two hours and ten minutes, including four stops, one of which was to back up and take on a sleeper. A reporter asked the engineer if that was not the very best time he could make on the O. & M. "Oh, no," he answered, "we were only jogging along at a comfortable speed. Come down and take a ride with us some day when we make real fast time." The reporter thanked him, but thought, with the Vice-President of the Southwestern, he would prefer a canal boat.—*Cincinnati Gazette.*

It is claimed that train No. 4 on the New York Division of the Pennsylvania Railroad made, on June 14, the fastest time yet made between Philadelphia and New York. The train consisted of locomotive No. 724 and two cars. Edward Osborne was the engineer, and Lewis Lilance conductor. The rain left Philadelphia at 12:51, and Jersey City was reached at 2:24 p.m., the trip of 90 miles having been accomplished in precisely 93 minutes. Four stops were made, and the train was slowed up at the Trenton and Hackensack bridges. The run af 26 miles from Trenton to New Brunswick was made in 24 minutes.

OLD AND NEW ROADS.

Alabama Great Southern.—The third general meeting of this company was held in London, England, recently, when the directors were able to submit a very gratifying report. The following resolutions, to be confirmed at a meeting to be held June 24, were passed: 1. That the capital of the company be increased by the sum of £193,400, divided into 19,340 preference shares, called "A," shares, of £10 each, forming one class with, and ranking *pari passu* with, and entitled to a preferential dividend of £6 per cent. per annum, in the same manner as the original 15,660 preference shares called "A" shares. 2. That the conditions of the memorandum of association of the company (Clause 5) be modified in accordance with the foregoing resolution, and, as altered, stand as follows: 5. The capital of the company is £1,916,000, divided into 35,000 £6 per cent. preference shares of £10 each, called "A" shares, and 156,600 ordinary shares at £10 each, called "B" shares; and that a corresponding alteration be made in Article 6 of the articles of association of the company. 3. That the directors may issue the aforesaid newly-created 19,340 preference shares, called "A" shares, or any part thereof, at any time, or from time to time, at such prices, to such persons, and in such manner, and generally on such terms and conditions as the directors shall deem expedient.

Atchison, Topeka & Santa Fe.—The Tucson (Arizona) *Citizen* of a recent date says: "Charles Thornton, in charge of an engineering corps of nineteen men, arrived in Tucson last night from the front. There are six engineers in the party, and the balance all Chinamen, flagmen, etc., and they are on their way to Guaymas to join Mr. Morley, Chief Engineer in charge of the work in New Mexico. They report the work progressing rapidly down the Rio Grande River in the direction of El Paso, and that the grading is completed 80 miles south of Albuquerque, and from 1½ to 2¼ miles of track is now being laid per day. Work is also progressing on the Kingman survey as far west as New Fort Wingate, about 100 miles west of Albuquerque. This is the route which was surveyed by Mr. Kingman, last summer. It passes through the southern portion of the San Carlos Indian Reservation, crosses the White River Mountains above San Carlos, down into Gila Cañon to a point a few miles above Old Camp Grant, and thence around the western base of Santa Catarina mountains to Tucson. Mr. Thornton and party leave to-morrow for Guaymas, where Mr. Morley is already actively engaged in organizing the preliminary work for the construction of the road from that place east. Contrary to general supposition it is not going to stop at the end of the division of 30 miles, but will be pushed on east or north to Arizona, as fast as the grading can be done. There will be two surveys made, one to the Rio Grande, to strike some 60 miles north of El Paso, and one to Tucson. Of course it is not positively known that the northern branch is to be extended to Tucson, but it is the general impression of all the men connected with the road that it is to go direct to Tucson, and that a branch will be built from the main line west to Prescott, which will afford an outlet for the northern portion of the territory. As the Kingman route so far has been agreed on the exact line reported by Mr. Kingman, there is no longer any doubt but that it is the purpose of the company to adopt the entire route, which leads direct to this place. Within a month from this date the company will have three sets of track-layers at work; two from the east, laying west, the one down the Rio Grande, and the other southwest from Albuquerque to Tucson, and the Guaymas Branch, laying east to meet them at some point in Arizona."

Atlantic, Mississippi & Ohio.—The United State Circuit Court has appointed a master to sell this road, under the final decree of the Court. Mr. M. F. Pleasants, Clerk of the Circuit Court, is the appointee. This order was issued by Judges Bond amd Hughes, on June 4, but no time is yet fixed for the sale, and it must first be advertised.

Baltimore & Ohio.—This company, it is said, is making preparations to run its own sleeping cars after the present contract with the Pullman Company expires, which will be on Oct. 1, next. It is said to be building a number of sleeping cars in its shops.

Boston & Albany.—The Finance Committee have reported in favor of an advance of 10 per cent. in all wages and salaries paid by the company, to date from June 1. It is understood that the board will take action accordingly.

Boston, Concord & Montreal.—The referees to whom the protest of this company against the tax levied on its property was given, have made a report to the New Hampshire Supreme Court, fixing the tax to be paid for the year at $19,120, a large reduction from the original assessment.

Boston, Hoosac Tunnel & Western.—The consolidation of the New York and Vermont companies of this name has been completed; all the legal formalities have been complied with and the proper certificate filed with the State Engineer of New York.

Boston, New York & Western.—This company has filed articles of incorporation in New York, to build a road from the line of the Boston, Hoosac Tunnel & Western road near Schenectady to Utica. The capital stock is to be $3,000,000. The leading corporators are Henry B. Hammond, Henry Stone, Robert Jenkins and others.

Bradford, Bordell & Kinzua.—This road is now completed from Bradford, Pa., southeast eight miles, and work is progressing towards Smethport, seven miles further. The completed section will shortly be opened for business. It is a narrow-gauge line, and is built to develop a new oil territory.

Burlington & Lamoille.—At a special meeting in Burlington, Vt., last week, the stockholders voted to ratify and confirm the contract with the Central Vermont Company, by which this company secures the use of the Vermont Central track between Burlington and Essex Junction.

Chicago, Clinton, Dubuque & Minnesota.—The following circular to stockholders is dated June 14:

"Some of the largest holders of the stock of the Chicago, Clinton, Dubuque & Minnesota Railroad Company have entered into an agreement with the Chicago, Milwaukee & St. Paul Railway Company, the main features of which are that they are to sell to said company their shares at the rate of 80 per cent. upon the par value thereof, the purchase money to be paid in the 6 per cent. bonds of said Chicago, Milwaukee & St. Paul Railway Company, payable in 40 years from the first day of July next, such bonds to be secured by a mortgage to the New England Trust Company upon the road of the Chicago, Clinton, Dubuque & Minnesota Railroad Company and its branches, and to contain a provision for an annual sinking fund, beginning July 1, 1885, of 1 per cent. per annum, sufficient to pay said bonds at maturity.

"To enable said railway company to make said mortgage, it is necessary that the title to the road and branches of the Chicago, Clinton, Dubuque & Minnesota Railroad Company should be vested in the Chicago, Milwaukee & St. Paul Railway Company, contemporaneously with the execution and delivery of the mortgage.

"To accomplish that purpose, the parties who propose to sell their shares are to place the same in the name and hands of Charles Merriam, as Trustee, to be used by him at all corporate meetings and otherwise that may be necessary to carry out the arrangement.

"The parties to this arrangement have, with a view of enabling all other shareholders, if they choose, to partake of the same, agreed that they may become parties thereto, by complying with its terms within a limited time.

"Shareholders who may desire to become parties to said arrangement should promptly sign annexed assent to same, immediately deposit their certificates with, and transfer the shares to Charles Merriam, Trustee, for the above purpose, so that the arrangement may be perfected, and the bonds delivered as near the first day of July next as practicable.

"Shareholders who surrender their stock will receive therefor a transferable receipt, in the form hereto subjoined."

Appended to the circular are forms of assent to the agreement, and of transferable receipts to be issued by the Trustee.

Chicago, Rockford & Northern.—The United States Circuit Court in Chicago has authorized the Receiver of this road to take such steps as are necessary to enforce the collection of certain sums now due the road from the Chicago, Burlington & Quincy Railroad Company. The two roads have had a running arrangement for some years past, by which the Chicago, Burlington & Quincy was to pay the Rockford road 20 per cent. of the earnings of the former road upon that portion between Aurora and Chicago, arising from business coming from and going to the Chicago, Rockford & Northern. The account was settled up to July 1, 1878, but no money has been paid since that date.

Chicago, St. Paul & Omaha.—The St. Paul *Globe* of June 12 has the following: "A mortgage or trust deed was filed in the Register of Deeds' office yesterday, which, viewed from the amount of the consideration, exceeds anything of the kind ever put on record in St. Paul. The instrument represents a railroad mortgage for $30,000,000, between the Chicago, St. Paul & Omaha Railroad Company and the Central Trust Company of New York. The instrument is very voluminous, first calling attention to the recent consolidations of the West Wisconsin and Sioux City Railroad companies and of their uncompleted lines of railroads. Among the feeders named to be completed by the company are the St. Paul, Stillwater & Taylor's Falls, the Blue Earth City and Black Hills Branches, the Luverne & Rock Rapids Branch and the Sioux Falls line. The mortgage is given to complete the above-named lines, and to procure such other feeders as the company may deem essential. It is stipulated that the Trust Company shall have a lien on all the above-named branches, and all railroads and railroad property owned by the company in Wisconsin, in addition to which they shall be entitled to all moneys arising from trespass on the lands belonging to the railroad company. It is also agreed that the lien shall extend to all railroads or railroad property belonging to the company, or to be acquired in the states of Wisconsin, Minnesota, Iowa, Michigan, Illinois, Nebraska and the territory of Dakota. It is provided that the company shall be allowed to issue

bonds not exceeding in amount $30,000,000, of the denomination of $1,000 each, to draw 6 per cent. interest, payable semi-annually in New York. The lien extends 50 years, and bonds may be issued on new lines or feeders not to exceed an indebtedness of $15,000 per mile. In case the railroad company fails to keep their obligations, or let any part of the principal or interest go unpaid six months after becoming due, the Trust Company shall have the right to convert or sell the property. The deed is signed by H. H. Porter, President, and C. N. Porter, Secretary of the Railroad Company, and H. F. Spaulding, President, and C. H. P. Babcock, Secretary of the Central Trust Company."

Columbus, Chicago & Indiana Central.—The Trustees and Receivers give notice that they will pay on presentation at the St. Nicholas National Bank in New York the following coupons on underlying sectional bonds: Columbus & Indianapolis Central first-mortgage bonds, due Jan. 1, 1880, and second-mortgage bonds, due May 1, 1880; Columbus & Indianapolis preferred first-mortgage, common first-mortgage and second-mortgage bonds, all due Jan. 1, 1880; Union & Logansport first-mortgage bonds, due April 1, 1880.

Corpus Christi, San Diego & Rio Grande.—Work is being pushed on the extension of this road westward. The grading is all done for 24 miles beyond San Diego, Tex., and the rails are expected soon. Five new engines and a number of cars have been ordered for the road.

Dallas & Wichita.—The Court has confirmed the sale of this road and ordered the transfer to be made. It was bought in the Texas & Pacific interest, and the new owners promise that work shall be begun at once on its extension.

Dayton, Covington & Toledo.—This company has voted in favor of consolidation with the Toledo, Delphos & Burlington. The road is now completed from Dayton, O., northward to Versailles, 41 miles, with an extension in progress to a connection with the Toledo, Delphos & Burlington.

Detroit, Butler & St. Louis.—The Detroit *Post and Tribune*, of June 22, says of this road, which is to extend the Eel River branch of the Wabash, St. Louis & Pacific to Detroit: "The contract for the building of the road was let yesterday to General J. S. and D. T. Casement of Painesville, O. The contract covers the entire work, including grading, furnishing ties, laying track, bridging, ballasting, fencing, etc. By the terms of the contract the work is to be wholly completed by Dec. 15 next.

"Gen. Casement has a reputation as a railroad builder. He constructed the Union Pacific at a rate of speed which attracted the attention of the whole country. He built the Canada Southern and has had experience upon other roads. His name is sufficient guaranty that the work will be not only put through on the double-quick, but that it will be well and thoroughly done. The intention is to put as many men at work as can be possibly employed. They will operate from each end and at various points along the whole line simultaneously. About three-fourths of the right of way has been already secured and negotiations are in active progress for the remainder. The road will start from Detroit Junction and bear to the southwestward, passing through Belleville, in this county, and thence direct to Adrian.

"The men and material will be got on the ground at the earliest possible moment, and the dirt will fly in earnest. It is expected that the cars will be running between this city and Adrian by Sept. 1."

Elizabeth City & Norfolk.—A correspondent writes us of this road as follows: "The grading on this road has progressed so rapidly in the last two months that we are now within 12 miles of Norfolk. The bridge over the Pasquotank River will be commenced within a week. We will begin laying iron about Aug. 1. The Allentown Rolling Mill Company and Atkins Brothers, of Pottsville, Pa., have taken the contract to furnish the iron. The Baldwin Locomotive Works are making the engines, three in number. A firm in Wilmington, Del., have the contract for all cars, etc. The iron will be 45 lbs. to the yard."

Flint & Pere Marquette.—The land sales of this company for the present year are as follows: From Jan. 1 to May 17, inclusive, there were sales of 11,787 acres, at an average of $17.26 per acre, amounting to $203,504.65. The sales numbered 73. The timber sales amounted to $3,196, making the total Land Department sales, in amount, $206,700.65. The collections during the same period amounted to $188,163.05. The bills receivable on hand May 1 were $912,089.12, of which $88,436.21 was for interest, and $823,652.91 for principal. The acres unsold May 17, 1880, were 178,285.

Georgetown & North Carolina.—This company invites proposals for building and equipping a narrow-guage road from Georgetown, S. C., to a junction with the Northeastern Railroad, a distance of about 42 miles. The roadbed has once been graded the entire distance, with the exception of four miles. Parties desiring to engage in the work are invited to confer with Col. J. D. Blanding, President of the company, who resides at Sumter, S. C., on the Wilmington, Columbia & Augusta road.

Georgia Railroad Commission.—In Atlanta, Ga., June 17, the United States Circuit Court denied the motion made by bondholders of the Savannah, Florida & Western Company to restrain the Georgia Railroad Commission from imposing their rates of freight upon the company. The decision was that the interest of the bondholders was too remote to warrant them in asking for an injunction. The Court, however, allowed a new bill to be filed on behalf of the stockholders, and on that granted a temporary injunction to hold until a hearing is had. The case under the new bill was set down for Sept. 14 next.

Grand Southern.—The contract for track laying and ballasting on the whole line from St. Stephen, N. B., to St. John has been let to McCabe, Powell & Co., of St. John.

At a meeting held in Carleton, N. B., June 15, the stockholders of the Carleton Branch Company voted to repudiate and set aside the agreement made for the lease of that road to the Grand Southern Company. This Carleton Branch is a short line leading to the wharves on the harbor of St. John.

Gulf, Colorado & Santa Fe.—Work is progressing well on the extension of this road from Brenham, Tex., to Caldwell. The tracklayers have reached Yegua Creek, 14 miles northward from Brenham, where a bridge is being put in. It is expected that the construction train will reach Caldwell by July 1.

Kansas City & Southern.—This company has filed articles of incorporation in Missouri for a railroad from Kansas City southeast through Jackson, Cass and Henry counties, to Clinton, a distance of 84 miles. The road is on the line of the old Kansas City, Memphis & Mobile. The capital stock is to be $840,000, and the incorporators are Theodore Wiederhold, W. J. Campbell and Joseph E. Young, Chicago, Ill.; John Sidle, Blue Island, Ill.; Lloyd B. Fuller, Emporia, Kan.; E. L. Martin, Kansas City; and Joel H. Nash, Austin, Mo.

Kansas Pacific.—A dispatch from Lawrence, Kan., June 19, says: "The important case of W. B. Lewis, Jr. *vs.* the Kansas Pacific Railway to foreclose mortgage and secure income bonds, came on for hearing to-day in the District Court in this city. On the part of Lewis it was alleged that the earnings of the road were applicable to the payment of interest on the bonds, while on the other hand it was alleged that the bonds and mortgages were void for the reason that they were issued without any consideration to a pool composed of contractors and directors of the company. Mr. Sharpley of St. Louis, and Mr. Green of Lawrence appeared for the plaintiff, and upon the case being called dismissed the suit on the first part of the trusts of Lewis, and asked to have the Court dismiss the whole case, but the company by its counsel opposed such dismissal, and demanded a trial upon its counter-claims, asserting that the company was prepared to prove the bonds and mortgages illegal and void, and that the company was annoyed by suits in various localities upon the bonds, and demanded an immediate trial, that it might invalidate the bonds, and so be rid of vexatious suits. The Court decided that the company had the right to have the question of the validity of the bonds tried upon the pleadings as they stood, although the Trustee had dismissed his part of the suit, but upon the claim of Mr. Sharpley that Lewis was not ready for trial, and desired to make further reply, the cause was continued till the October term."

Long Island.—This company has started again its line between New York and Newport, R. I., by running a fast express train between Hunter's Point and Greenport in connection with a steamboat line between Greenport and Newport. It is also proposed to make this a Boston line by putting on an express train on the Old Colony road, to run between Newport and Boston in connection with the boat. Years ago, before the New Haven road was built, the Long Island road was part of a through line to Boston, which was much patronized.

Louisville, New Albany & Chicago.—At a special meeting in New York, June 21, the stockholders voted unanimously to authorize the execution of the new mortgage to secure $3,000,000 of bonds. This will be a first mortgage, the company having now no bonded debt. The proceeds are to be used for improvements, new equipment, etc.

Minneapolis & St. Louis.—Track is now laid for 30 miles south by west from the winter terminus at Forest City, Ia., leaving only about eight miles to reach Livermore where connection will be made with the line already built up from Ft. Dodge by the Ft. Dodge & Ft. Ridgely Company and now owned by this company. The work has been somewhat delayed by high water.

Grading is progressing well on the branch from Hopkins, Minn., to Lake Minnetonka. The work is to be pushed as fast as possible.

Missouri, Kansas & Texas.—The Union Trust Company, Trustee in possession, on June 18 began paying $25 and funding $10 upon each coupon due Aug. 1, 1879, upon such of the consolidated first-mortgage bonds as have been stamped, subject to the agreement of March 1, 1876.

New Castle & Franklin.—The Pennsylvania Supreme Court, on appeal, has set aside the order of the lower Court restraining the trustee under the first mortgage on this road from selling the road. The Court holds that the majority of the bondholders must decide, and that the trustee, under their instructions, can go on and sell the property to satisfy the mortgage. The road has, for a year past, been in the hands of a receiver, pending the decision in this case.

New Jersey Railroads.—Col. R. F. Stevens has prepared the following brief summary from the reports made to the State Comptroller of New Jersey for the year 1879:

Number of companies reporting	66
Miles of road	1,727
Capital stock ($48,483 per mile)	$83,730,679
Funded debt ($61,869 per mile)	106,847,951
Other debt ($5,869 per mile)	10,136,077
Total stock and debt	$200,714,707
Gross earnings ($12,546 per mile)	21,667,733
Expenses (65.91 per cent.)	14,280,522
Net earnings ($4,277 per mile)	$7,387,211
Dividends paid	3,322,991

The net earnings were 3.66 per cent. upon the total stock and debt. The dividends paid were 3.97 per cent. upon the total stock. The stock and debt are large in amount, but it must be remembered that the railroads of New Jersey include, in proportion to their total length, a larger number of costly lines with large investments in terminal facilities and similar works than those of any other state. The capital account is to some extent duplicated, the United New Jersey, for instance, owning a large amount of the stock and bonds of its leased and controlled roads, these investments being represented in its own capital account.

New Martinsville, Middlebourne & Pennsboro.—This company has filed articles of incorporation in West Virginia, to build a narrow-gauge railroad from New Martinsville, in Wetzel County, by Point Pleasant Valley and Middle Island Creek, to Middlebourne, in Tyler County, and thence by the most practicable route to Pennsboro, in Ritchie County. The principal office is to be at New Martinsville. The distance is about 35 miles, in a southwest direction. The capital stock will be $100,000. At Pennsboro the road will connect with a short narrow-gauge road running to Harrisville on the Baltimore & Ohio.

New York Lake Erie & Western.—The gauge of the Western Division, from Hornellsville, N. Y., to Dunkirk, 154 miles, was changed from 6 feet to 4 feet 8½ inches, on the morning of June 22. A force of 800 men had been gathered, and all possible preparations made beforehand. The men were distributed along the line and began work at 4 o'clock. The work was completed in six hours, a train leaving Hornellsville at 10:30 on the narrow gauge.

The Western & Buffalo Divisions are now of standard gauge. The other main line divisions from Hornellsville east to Jersey City have the third rail, making them both of 6 feet and standard gauge, and the Rochester Division, from Corning to Rochester, is still of 6 feet gauge only.

New York, Pennsylvania & Ohio.—The press dispatches announce that the change from 6 feet to standard gauge on this road was made successfully on June 22, as arranged. The change made was of the 224 miles from Dayton to Leavittsburgh; a third rail has already been laid from Leavittsburg to Salamanca, 165 miles, leaving the 6-feet gauge there that the wide-gauge equipment may be worn out in the local traffic.

The Mahoning Division from Cleveland to Sharon has always had a third rail, and this is now to be taken up.

Northern Pacific.—On the Missouri Division the track has now reached a point 100 miles from Mandan, Dak., and 25 miles beyond the late terminus at Knife River. The road is to be completed to the Yellowstone this season.

The Bismarck (Dak.) *Tribune* thus describes the line from Mandan westward: "Along this entire line not a sign of civilization can be seen, except at the few station houses. The track bed is in excellent condition, and the scenery is varied, wild and interesting. The road crosses the Heart six times in five miles and the Sweet Briar 27 times in eight miles. Comanche, the first station west of Mandan, is but a side track, and is better known as Rattlesnake Station. Why it was ever thus named is best known to the graders who first established the town. There never has been but two or three of these reptiles seen over the river on the line. The grade between Mandan and Comanche is very heavy, many places being the maximum grade, 50 feet to the mile. In ascending from the Heart Valley to the table-lands above, the track winds snake-like around the foot-hills, the curves being so short in some instances, that not over half-a-dozen cars can be seen at one time. The Sweet Briar is quite an extensive valley, but the land is not as good as that of the Curlew and uplands further west, but as a stock range it cannot be excelled. Blue Grass station is so called because of the luxuriant growth of blue grass in the immediate vicinity. This grass is so rank that the valley looks like a vast oat field. Near Baby Mine is Spring Tank station. Water is furnished the tank from a beautiful spring bubbling out from the side of a bluff about 300 feet from the track. The wind-mill is placed over the spring and the water forced into the tank through pipes. At Baby Mine there is considerable activity. About 35 men are now at work, each man mining from three to five tons of coal per day. Baby Mine is a bonanza, and is giving its owners, Messrs. Bly & Thompson, a neat revenue. The main passage is now about 300 feet into the bluff, with a fall of one inch to the foot. The vein being worked at present presents a seven-foot face, and the quality of the coal is superior to ordinary lignite. These coal beds underlie the larger portion of the country west of Mandan, cropping out in many places on the streams and cuts along the road. In digging the wells for the water-tanks, extensive veins are struck. A few miles west of Baby Mine the road makes a sudden turn to the northeast and the beautiful Curlew Valley is reached. This valley is about 15 miles long and in some places is nearly five miles wide. On either side are ranges of bluffs which resemble barracks or barricades. At the western end of the valley is Curlew station, and 7 miles further on is the Y, 58½ miles from Bismarck. From this point west to the supply store there is a gradual rise. The quality of the soil becomes better as the summit or divide is reached, and the best stretch of country west of the Missouri thus far traversed by the Northern Pacific is from Young Man's Butte west to the Bad Lands. The supply store, which is now about 75 miles west, will remove in a few days to Green River, where it will remain until the road is completed to the Little Missouri. Graders are at work all along the line from Green River to the Little Missouri, and by the time the contract for building the second hundred miles of track is let, the grade will be ready for the rails."

On the Casselton Branch track is now laid from Casselton, Dak., north 16 miles, and work is to be pushed forward 14 miles further, to Elm River.

A survey has been made for a branch to extend from the Puyallup Branch of the Pacific Division to the Carbon River coal mine, a distance of three miles. It is to be built at once.

The company promises to have track laid this year from the Columbia, at the mouth of Snake River, to Lake Pend d'Oreille, a distance of 210 miles. Work on that division is being pushed.

Ogdensburg & Lake Champlain.—The Boston *Traveler* of June 22, says: "Suits in equity have been entered in the Circuit Court of the United States for the District of New Hampshire, in behalf of the Ogdensburg & Lake Champlain Railroad Company, against the Northern Railroad Company of New Hampshire, the Nashua & Lowell Railroad Company, and General George Stark, founded upon the agreement made in 1871 between the Northern Transportation Company of Ohio, J. Gregory Smith of Vermont, and George Stark, as trustees and managers of the Vermont Central Railroad Company, and of the Vermont & Canada Railroad Company, the Northern Railroad Company of New Hampshire, the Nashua & Lowell, and Boston & Lowell Railroad corporations.

"Under this agreement a sum amounting to $600,000 was advanced to the Northern Transportation Company to secure control of its business soon after its failure. This amount, it was agreed, should be repaid to the Ogdensburg & Lake Champlain Railroad Company by the other roads proportionately; $208,000 of it has been so paid, leaving a balance of $392,000 and interest due, for which the suit is brought.

"A similar suit has been begun in the Massachusetts district against the Boston & Lowell Railroad Company, and probably the result of the litigation in that action will govern the other parties in these suits.

"The Hon. S. Bartlett, of Boston, and Wallace Hackett, of Portsmouth, are counsel in the cases in the New Hampshire District for the complainants.

"The bills filed set forth the contract, copies of which are annexed. The answers will be required at the August rules of the Court, and calls for an account of the gross receipts from the business. In the suit against the Boston & Lowell Railroad Company in Massachusetts, Messrs. Abbott and Lovering, counsel for the defendants, have filed a general demurrer to the bill."

Ohio & West Virginia.—The track on this road is now laid from Logan, O., southward through McArthur to Eagle Furnace, about 35 miles, the construction train reaching that point last week. Work is also being pushed on the southern end of the road, and the track is down from Gallipolis on the Ohio to Vinton in Gallia County, a distance of 15 miles, leaving only a short gap to fill.

The road is controlled by the Columbus & Hocking Valley, and will be worked as an extension of that road.

Owensboro & Nashville.—This company, purchaser of the Evansville, Owensboro & Nashville road under the decrees of sale in bankruptcy of April 1, 1876, and March 20, 1877, having finally paid up in cash and bonds the full amount of the bid, in accordance with the terms of the sale, the United States District Court has ordered the bonds given at the time of the sale to be canceled, and a full conveyance of the property made. The court also ordered a dividend of 3.43 per cent. on the face of the bonds to be paid to holders of the old bonds, from the funds in charge of the Court.

The road is now the property of the Louisville & Nashville Company.

Philadelphia & Reading.—A plan for reorganization has been proposed in England, under which the stockholders are to pay $15 per share assessment, and there is to be a foreclosure of the consolidated mortgage. It has called out some discussion, but it is generally considered too soon yet to prepare any definite plan. It is thought, too, that it would not be easy to collect any such assessment as proposed.

There is some complaint in English papers that the committee formed in London represents the stockholders chiefly and will naturally look out for their interests. It is claimed that the committee should be enlarged or reorganized, so that the bondholders may be represented.

The statement promised by the Receivers is not yet ready, and it is uncertain when it will appear. A statement of the earning for April and May, in the usual form, was also promised, but has not yet been given out.

Pennsylvania.—Track-laying has been begun on the extension of the Lewisburg & Tyrone Branch from Spring Mills, Pa., to Tyrone. The work is advancing from the Tyrone end, and the rails are laid to Hamer's Mill, two miles. A construction train has been put on the road, and it will be finished to Pennsylvania Furnace in a short time.

Work is progressing steadily on the new elevated line into Philadelphia. The bridge over the Schuylkill is partly up, and the work of erecting it is going on as fast as possible.

This company's report for May shows for all lines east of Pittsburgh and Erie, as compared with the same month in 1879:

An increase in gross earnings of (26.2 per cent.)	$709,221
An increase in expenses of (15.9 per cent.)	266,461
Net increase (42.8 per cent.)	$442,760

For the five months ending May 31, as compared with the same period in 1879, the same lines shows:

An increase in gross earnings of (24.5 per cent.)	$3,189,347
An increase in expenses of (14.8 per cent.)	1,352,046
Net increase (35.0 per cent.)	$1,837,301

All lines west of Pittsburgh and Erie, for the five months of 1880, show a surplus over liabilities of $1,302,655, being a gain over the same period in 1879 of $1,469,605. This makes a net gain for the five months of $3,306,906 on the whole system.

St. Paul, Minneapolis & Manitoba.—The St. Paul *Pioneer-Press* says: "The Land Department of the St. Paul, Minneapolis & Manitoba Railroad Company is doing a rushing business this month, and the office is daily besieged by land seekers, all anxious to avail themselves of the splendid inducements offered by the company to purchasers of lands in the fertile Red River Valley. Within the last two days two large sales have been made. One comprised ten sections, 6,380 acres, in Kittson County, to a party of Canadians and Americans, who will break 1,800 acres this season. The other sale consisted of six sections, 3,840 acres, to a California gentleman who had previously purchased five sections. He is also breaking 1,800 acres. The town lot sales in the valley are also rapidly increasing. There promises to be no let up to the land boom in the Red River Valley for months to come."

Sanpete Valley.—The grading of this road is now nearly all finished from the junction with the Utah Southern at Nephi, Utah, to the coal mines at Wales in the Sanpete Valley, a distance of 30 miles. The iron has been bought, and 500 tons of 40-lbs. rails are already on the way. The engines and cars have been ordered, and the ties are now being distributed along the line. Preparations have been made to mine coal on a large scale at Wales as soon as the road is finished. There is some talk of extending the road from Wales to Manti, where there is an abundance of fine white sandstone for building purposes.

Savannah, Florida & Western.—The contract for the grading, bridging and ties of the Waycross & Florida road (the section from Waycross, Ga., to the St. Mary River of this company's new line to Jacksonville), has been let to Walthour & Reed and was begun this week. By the terms of the contract it is to be ready for the iron by Nov. 15. The bridge over the St. Mary River will be of iron, on brick piers.

From the St. Mary to Jacksonville the line is known as the East Florida road, and the contract for grading this section was to be built this week.

The new road will make a tolerably direct line from Savannah to Jacksonville. Waycross is 96 miles from Savannah, and from Waycross to Jacksonville it is 74 miles, making 170 miles from Savannah to Jacksonville, against 261 miles by the present all-rail line by Dupont and Live Oak. The 91 miles thus gained will be a considerable advantage both for the Florida passenger business and for the growing traffic in fruits and early vegetables. It will, doubtless, increase the travel by the all-rail lines, but it will take away the best part of the business of the Jacksonville, Pensacola & Mobile—and that road has none to spare.

Shenandoah Valley.—The Warren (Va.) *Sentinel* of recent date says: "On June 17 a corps of engineers accompanied by Major U. L. Boyce, Vice-President of the Shenandoah Valley Railroad Company, will begin the survey of the line of a railroad, commencing at Afton, following the eastern slope of the Blue Ridge through the county of Nelson, by Buffalo Springs and Balcony Falls, on to Liberty, on the Atlantic, Mississippi & Ohio Railroad, west of Lynchburg; thence through Chandlissburg, and Taylor's Store and Rocky Mount, in Franklin County; thence through Patrick County to Taylorsville, near Rock Castle; then crossing the North Carolina state line to Mount Airy, in Surry County. Then to Dobson; thence into Wilkes County to Briar Creek and Wilkesboro'; then through Elkville, King's Creek, Fort Defiance, to Morganton, which is on the line of the Western North Carolina Railroad; from Morganton to Asheville, in Buncombe County; thence up the French Broad to Datonville, in Transylvania County; then following the Tugalo River down to Toccoa City, which is on the line of the Atlanta & Air-Line. This proposed road passes through the finest mineral belt of the south Atlantic states, and will, when built, give the Shenandoah Valley Railroad, through the Rockfish tunnel of the Chesapeake & Ohio Railroad Compan, direct communication with Atlanta and the system of railroads centering there."

Southeastern of Canada.—It is announced that this company has concluded an agreement with the Grand Trunk, under which a connection will be made with that road and the Southeastern trains will run across the Victoria Bridge into Montreal. Heretofore they have run to Longueuil, on the south side of the St. Lawrence, making connection with Montreal by ferry. The Grand Trunk has always refused to make connections with this road.

Southern Railroad Combination.—The report of the formation of a Southern combination including the Richmond & Danville and the Atlantic Coast Line, with some tributary roads, as noted last week, is confirmed. The details of the combination have not been made public, and it is stated that no syndicate has been formed, the combination having been effected by a few gentleman whose object was chiefly to protect the large interests already owned by them in several of the lines.

Springfield & Clinton.—This company has been organized to build a railroad from Springfield station, in Summit County, O., on the Valley road, west to Clinton, a distance of about five miles.

Stockton & Bodie.—It is proposed to build a narrow-gauge road from Stockton, Cal., to the Bodie mining district. At a meeting held in Stockton recently nearly $50,000 were subscribed to the stock, and it was decided to have a survey made of the proposed line at once,

Texas & Pacific.—The Dallas (Tex.) *Herald* of June 15 says: "We have seen a note from Captain W. W. Johnson, Engineer in charge of the track-laying and bridging on the Texas and Pacific Rio Grande extension, stating that the track was laid to the fortieth mile-post from Fort Worth on Saturday evening, June 12, and that Col. Noble on the part of the Texas & Pacific Railway Company, had been out on that day to review the same, it being the second installment of 20 miles since leaving Fort Worth. The track is still being laid with energy and vigor towards the Brazos River, 12 miles further, and will reach that point about the 20th proximo. No stoppage will be made here, but on toward Eastland City, 50 miles further, which point will be made about Sept. 1."

Toronto, Grey & Bruce.—The Toronto (Ont.) *Monetary Times* of June 19 says: "A meeting of the bondholders of this company was held in this city last week. The Vice-President of the company was present on behalf of the directors. Explanations were given as to the progress which had been made in the negotiations with the municipalities in reference to the carrying out of the change of gauge. The directors reported that by-laws for bonuses to aid the company in carrying out the new scheme had already been carried in the following municipalities, viz.: Arthur, $8,000; Wroxeter, $4,000; Teeswater, $8,000; and Owen Sound, $15,000; and that in the following townships by-laws had been submitted to the vote of the people, and would be voted upon during the present month, viz.: Artemesia, $20,000; Melancthon, $20,000; and Proton, $15,000; also that the various other townships and towns along the line would shortly be asked to submit by-laws for bonuses as previously arranged."

Utah, Eastern.—There is now a considerable force at work on the grading of this road between Coalville, Utah and Kimball. The force is to be increased, as more contracts will be let as soon as the work of location is completed.

Wabash, St. Louis & Pacific.—The *Commercial and Financial Chronicle* says: "The new $50,000,000 mortgage has been executed by the Wabash, St. Louis & Pacific Railroad Company in favor of the Central Trust Company, of New York, and James Cheney, of Indiana, trustees for the boudholders. The conveyance is to secure $50,000,000 of bonds issued, or to be issued, by the company, for the purpose of paying certain other bonds, building and buying railroads, bridges, barges, etc. All the railroad lines, rolling-stock, franchises, etc., of the Wabash, St. Louis & Pacific, extending from Toledo to Council Bluffs and Kansas City, with all its branches and connecting lines, are embraced in the mortgage. The Trust Company is required to certify and issue $33,000,000 of the bonds in exchange for the first and second mortgage bonds heretofore issued, at par. Six millions of bonds are to be delivered to the agents of the company for the equipment of the roads, and $11,000,000 to the directors, when called for, to purchase other roads, construct barges, etc. The bonds are payable in 40 years, and bear 6 per cent. interest, payable semi-annually in New York. The deed is signed by Solon Humphreys, President, and James F. Howe, Secretary, of the Wabash, St. Louis & Pacific.

The St. Louis *Globe-Democrat* says: "For more than a year the Hannibal & St. Joseph and the Wabash, St. Louis & Pacific have been fighting over the price to be paid by the Wabash for the privilege of crossing the bridge at Kansas City. For ten years previous to last year the Wabash paid $55,000 for crossing that structure, but, as soon as the consolidation was announced, the Hannibal & St. Joseph demanded $6 per car, or enough to make it cost the Wabash nearly $200,000 per annum, for the bridge privilege. The matter was laid before the Supreme Court at Jefferson City, but was finally left with three arbitrators. The arbitrators have had the case for over six months. The directors of both roads became tired of waiting, got together to come to an understanding concerning this matter. The result of this conference was announced yesterday. It is a contract to run for 30 years at the old figures, $55,000 per annum."

West Jersey & Atlantic.—This road was formally opened for business, June 16, when an excursion train passed over the road, and the occasion was celebrated by a collation, speeches, etc., at Atlantic City. The exact length of the road from the station in Atlantic City, N. J., to the junction with the West Jersey at Newfield, is 34.46 miles, and from the junction to Camden is 29.88 miles, making the whole distance from Camden to Atlantic City, 64.34 miles. The only stations of any size on the new road, are May's Landing and Pleasantville, most of the line being through the pine barrens where there are very few people. The country is level and the work on the road was very light. Regular trains are now running, though there is still some work to be done in ballasting, surfacing, building sidings and completing station-houses. A large and convenient excursion house has been built at the Atlantic City terminus and will be under the control of the road. The track is laid with steel rails and the road has been substantially built. It is carried across the meadows back of Atlantic City on piles, but this part of the line is to be gradually filled in with gravel.

The road will be worked by the West Jersey Company which owns $100,000 of the capital stock of $500,000. That company has provided six new locomotives and thirty passenger cars for the new line, and a number of excursion cars will be added.

Wisconsin Valley.—The following circular to stockholders has been issued, under date of June 14:

"Some of the largest holders of the stock of the Wisconsin Valley Railroad Company have entered into an agreement with the Chicago, Milwaukee & St. Paul Railway Company, the main features of which are that they are to sell to said company their shares at the rate of 85 per cent. upon the par value thereof for the preferred stock, and 70 per cent. upon the par value thereof for the common stock, the purchase money to be paid in the 6 per cent. bonds of said Chicago, Milwaukee & St. Paul Railway Company, payable in 40 years from the first day of July next, such bonds to be secured by a mortgage to the New England Trust Company upon the road of the Wisconsin Valley Railroad Company, and to contain a provision for an annual sinking fund, beginning July 1, 1885, of 1 per cent. per annum, sufficient to pay said bonds at maturity.

"To enable said railway company to make said mortgage, it is necessary that the title to the road of the Wisconsin Valley Railroad Company, subject to the existing mortgage, should be vested in the Chicago, Milwaukee & St. Paul Railway Company, contemporaneously with the execution and delivery of the mortgage.

"To accomplish that purpose, the parties who propose to sell their shares are to place the same in the name and hands of Charles Merriam, as Trustee, to be used by him at all corporate meetings and otherwise that may be necessary to carry out the arrangement.

"The parties to this arrangement have, with a view of enabling all other shareholders, if they choose, to partake of the same, agreed that they may become parties thereto, by complying with its terms within a limited time.

"Shareholders who may desire to become parties to said arrangement should promptly sign annexed assent to same, immediately deposit their certificates with, and transfer the shares, to Charles Merriam, Trustee, for the above purpose, so that the arrangement may be perfected, and the bonds delivered as near the first day of July next as practicable.

"Shareholders who surrender their stock will receive therefor a transferable receipt, in the form hereto subjoined."

Forms of transfer of stock to the Trustee and of transferable receipts to be issued by him are appended to the circular.

ANNUAL REPORTS.

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Chicago, Rock Island & Pacific.

The mileage worked by this company at the close of its last fiscal year, March 31, 1880, was as follows:

	Miles.
Main Line, Chicago to Council Bluffs	500.25
Branch, South Englewood to South Chicago	9.00
Branch, Wilton Junction, Ia., to Knoxville	128.00
Branches, Des Moines, Ia., to Indianola and Winterset	48.00
Branch, Newton, Ia., to Monroe	17.00
Branch, Atlantic, Ia., to Audubon	25.60
Branch, Atlantic, Ia., to Lewis	9.00
Branch, Avoca, Ia., to Harlan	12.00
Total owned	748.25
Peoria & Bureau Valley, Bureau Junction, Ill., to Peoria	46.75
Iowa Southern & Missouri Northern, Washington, Ia., to Leavenworth, Kan	271.00
Branch, Edgerton, Mo., to Atchison, Kan	29.00
Keokuk & Des Moines, Keokuk, Ia., to Des Moines	162.00
Hannibal & St. Joe, use leased, Cameron to Kansas City	54.00
	562.75
Total worked	1,311.00

Additions during the year were the purchase of the Newton & Monroe Branch, the building of the line from Atlantic to Lewis, and the lease of the use of the Hannibal & St. Joseph track from Kansas City to Cameron. The average mileage for the year was 1,257 miles, against 1,125 the previous year.

Since the close of the year, all the leased lines and Iowa branches have been consolidated with this company, leaving the Peoria Branch and the Hannibal & St. Louis track the only leased lines.

The equipment consists of 276 locomotives; 96 passenger, 17 sleeping, 4 dining, 6 postal, and 34 baggage, mail and express cars; 3,611 box, 987 stock, 1,408 flat and coal, and 155 caboose cars; 2 pay cars, and 631 repair and hand cars. The increase was 17 engines; 6 passenger, 1 sleeping and 3 baggage cars; 426 box, 135 stock, 28 flat and 15 caboose cars; 31 road and service cars.

The Land Department reports sales of 86,656.36 acres for $747,478.34, an average of $8.62½ an acre. The bills receivable on land account now amount to $1,203,625.81. The Department, after paying all expenses, turned over $350,000 to the Treasurer of the company.

The balance sheet at the close of the year is as follows:

LIABILITIES.

Capital stock fixed, $25,000,000; amount issued		$20,979,900.00
Fractional scrip, convertible into stock		100 00
Six per cent. mortgage coupon bonds	$5,230,000.00	
Six per cent. mortgage registered bonds	4,765,000.00	
Seven per cent. sinking fund bonds (called in)	5,000.00	
		10,000,000.00
Suspense account		5,144.99
Profit balance of income account		8,571,433.23
Total		$39,556,578.22

ASSETS.

Cost of road and equipment, including all branch roads owned by the company		$34,923,675.73
Cost of railroad bridge at Rock Island		758,526.10
Capital stock and bonds of connecting roads		2,327,070.80
Six per cent. mortgage coupon bonds on hand		50,000.00
Loans payable on demand and cash in New York		1,008,734.52
Due from Post Office Department		47,609.59
Cash and balances due from other roads in hands of Local Treasurer, Chicago		164,953.57
Stock of material, fuel, etc., on hand	$463,907.84	
Less bills, etc., due in Chicago	188,499.93	
		275,407.91
Total		$39,556,578.22

By the consolidation above referred to the stock will be

doubled. The company is liable as guarantor on $5,000,000 Chicago & Southwestern bonds.

The traffic for the year was as follows:

Train mileage:	1879-80.	1878-79.	Increase.	P.c
Passenger	1,834,556	1,585,910	248,646	15.7
Freight	6,436,743	5,394,914	1,041,829	19.3
Service	676,737	565,266	111,471	19.7
Total	8,948,036	7,546,090	1,401,946	18.6
Car mileage:				
Passenger-train cars	8,780,352	7,631,378	1,154,979	15.1
Freight cars	92,057,471	85,450,556	6,606,915	7.7
Passengers carried	1,905,418	1,500,960	404,458	26.9
Passenger mileage	82,610,900	62,811,574	19,799,326	31.5
Tons freight carried	2,906,765	2,236,270	730,495	32.7
Tonnage mileage	654,861,579	484,610,209	180,251,370	37.2
Av. train load:				
Passengers, number	45	40	5	12.5
Freight, tons	103	90	13	14.4

The average tonnage per loaded freight car was 10.077 tons. Company freight carried was 270,902 tons, or 21,597,375 tons carried one mile, for which no charge is made in the accounts. It is noticeable that the great increase in traffic was moved with a comparatively small increase in car mileage.

The average receipts, etc., per train mile and per unit of traffic were as follows, in cents:

	1879-80.	1878-79.	Inc. or Dec.	P. c.
Earnings per passenger-train mile	144.000	118.000	I. 26.000	22.0
Earn. per freight-train mile	125.000	120.000	D. 4.000	3.1
Expenses per train mile	64.700	67.300	D. 2.600	3.9
Cost of motive power per mile	16.170	16.580	D. 0.410	2.5
Cost of maintenance of way per mile	15.570	13.830	I. 1.740	12.6
Receipt per passenger per mile	2.806	2.974	D. 0.168	5.6
Receipt per ton per mile	1.210	1.430	D. 0.220	15.4
Cost per ton or passenger per mile	0.685	0.885	D. 0.200	22.6

The following comparative statement will show the tons of freight moved and decrease in rates received for the past ten years, company freight included:

	Tons carried one mile.	Average rate per ton per mile.
1869-70	130,683,671	2.74 cents
1870-71	151,804,519	2.64 "
1871-72	198,704,688	2.49 "
1872-73	219,394,094	2.29 "
1873-74	249,523,401	2.07 "
1874-75	287,913,578	1.92 "
1875-76	288,525,696	1.91 "
1876-77	337,135,683	1.71 "
1877-78	370,436,382	1.56 "
1878-79	510,859,804	1.43 "
1879-80	686,438,954	1.31 "

The earnings for the year was as follows:

	1879-80.	1878-79.	Inc. or Dec.	P. c.
Passengers	$2,318,452.20	$1,868,027.71	I. $450,424.49	24.1
Freight	8,035,165.29	6,929,925.99	I. 1,105,230.30	15.9
Express and mail	321,081.78	267,083.29	I. 53,998.49	20.2
Rents, etc	386,963.19	344,796.42	I. 42,166.77	12.2
Total	$11,061,662.46	$9,409,833.41	I. $1,651,829.05	17.6
Expenses	5,500,704.49	4,861,716.79	I. 638,987.70	13.1
Taxes	295,841.62	218,155.70	I. 77,685.92	35.6
Total	$5,796,546.11	$5,079,872.49	I. $716,673.62	14.1
Net earns	$5,265,116.35	$4,329,960.92	I. $935,155.43	21.6
Gross earns per mile	8,800.05	8,364.30	I. 435.75	5.2
Net earnings per mile	4,183.64	3,848.85	I. 334.79	8.7
Per cent. work'g exp.	49.73	51.67	D. 1.94	3.8
Per cent. exp. and taxes	52.40	53.99	D. 1.49	2.8

The income account, in a condensed form, is as follows:

Net earnings, as above	$5,265,116.35
Receipts from Land Department	350,000.00
Total	$5,615,116.35
Rentals of leased roads	$372,537.37
Interest on bonds	940,610.00
Dividends, 10 per cent	2,097,990.00
	3,311,137.37
Surplus for the year	$2,303,978.98
Balance, April 1, 1879	6,267,454.25
Balance, April 1, 1880	$8,571,433.23

From the surplus for the year as above there was expended $1,128,672.12 for new construction and equipment; the chief items being $424,526.84 for new equipment; $213,865.48 for 23.633 miles second track; $110,637.35 for construction of branches, and $78,685.71 for 12.38 miles of new sidings.

Of the total surplus of income as above $4,702,201.83 has been absorbed in construction account, and $2,377,670.80 invested in securities of connecting roads.

An extension of the branch from Lewis is now in progress, and also a branch from Guthrie, Ia., northward.

The report says: "In the month of December an arrangement was made with the Hannibal & St. Joseph Railroad Company whereby this company obtains the right, for a term of 25 years, to run its passenger and freight trains from Cameron to Kansas City, together with the right to use jointly the freight depot, tracks and other facilities of the said Hannibal & St. Joseph Railroad in Kansas City. The terms are briefly, interest at 7 per cent. on one-half the valuation of road used, one-half the taxes, and a portion of the cost of maintenance proportioned to the train mileage of the parties using it. Bridge tolls over Missouri River substantially the same as at Atchison or Leavenworth.

"An agreement was also made with the Union Passenger Depot Company, by which our trains and passengers are allowed to participate in the privileges and benefits of the Union Passenger Depot at Kansas City upon the same terms accorded to eight other railroad companies whose trains run to that point.

"Under these arrangements through passenger and freight trains commenced to run between Chicago and Kansas City on Jan. 5, with decided advantage to the traffic and earnings of this line.

"A traffic contract has been made by which the Hannibal & St. Joseph Railroad takes passengers and freight of this company between Cameron and the city of St. Joseph on fair and equitable terms.

"Your company are now enabled to compete more successfully than before for a share of the through Southwestern business. This traffic is increasing largely in both passengers and freight, Kansas City being the most prominent business point in the Southwest.

"Connections are made and through cars are run to Atchison and Leavenworth as heretofore.

"On Jan. 1 a contract was concluded with the Pullman Palace Car Company, whereby this company sells one-half interest, and transfers to the Pullman Company the control and management of its line of sleeping and parlor cars. The Pullman Company pays this company one-half the appraised valuation of the sleeping-car equipment, and one-half the net receipts, withdrawing all claims for infringement of sleeping-car patents used heretofore by this company.

"In view of the extensive ownership and control of sleeping cars exercised by the Pullman Company on connecting and competing lines of railway, your board deemed it inexpedient to continue the independent operation of the sleeping-car line by this company.

"Should additional sleeping cars be required, under the terms of this contract the Pullman Company are to furnish them—charging this company with half the cost, or, if only occasionally required, an agreed mileage rate.

"The condition of the roadway, track and buildings has been materially improved during the past year, and was never in so good condition for doing business as now.

"The steel rails in use have increased 17,090 gross tons: 2,283 tons were used in new second track, and 14,807 tons in renewals, the entire cost of this last item being charged in operating expenses. The steel rails purchased and laid by this company to date of this report amount to 74,852 gross tons, equal to 796 miles of track.

"In the renewal of bridges, and the increase of capacity of water stations and other buildings, large expenditures have been made and, a very marked improvement is manifest. In addition to the iron bridges and culverts of masonry previously referred to, 14,383 lineal feet of pile and trestle bridging, and 2,230 lineal feet of truss and girder bridges have been wholly or in part renewed, and cost charged to operating expenses.

"In reviewing the detailed operations of the past year, showing that the volume of freight moved has more than doubled within three years, your board are convinced of the necessity of speedily completing a continuous second track from Chicago to the Mississippi River, and the importance of providing increased facilities and storage room for grain at Chicago and other terminal and junction points, and the board confidently appeal to the stockholders to ratify and approve a continuance of the policy heretofore pursued of applying a reasonable percentage of the net earnings to perfecting, extending and increasing the value of their property."

Pittsburgh, Ft. Wayne & Chicago.

This company owns a line from Pittsburgh to Chicago, 468.39 miles. It leases the New Castle & Beaver Valley road, 14.95 miles, and the Lawrence Railroad, 22.04 miles, but only the net result from those branches is reported. The whole property is leased to and worked by the Pennsylvania Company. The present report is made by the lessor company for the year 1879.

The equipment, as reported by the lessee, consists of 272 engines; 153 passenger, 5 market, 5 postal and 54 baggage cars; 3,378 box, 1,242 stock, 2,035 flat and gondola, and 127 caboose cars.

The capital account is as follows:

Stock at date of lease		$19,714,285.71
Guaranteed special stock issued for betterments		6,461,500.00
Total stock ($55,885 per mile)		$26,175,785.71
Funded debt ($23 843 per mile)		13,510,000.00
Coupons and dividends unclaimed, etc		110,598.99
Balance to credit of income		2,667,860.87
Total		$42,464,245.57
Cost of road ($82,722 per mile)	$38,746,021.15	
Supplies transferred to lessee	468,724.84	
Sinking fund, bonds and cash	2,834,887.95	
Sundry cash items to meet claims	193,380.74	
Securities owned	200,000.00	
Cash	21,231.19	
		42,464,245.57

The trustees of the sinking fund hold $1,121,000 first and $1,210,000 second-mortgage bonds, of which $91,500 were bought during the year. They now hold $285,015.12 in cash for the purchase of bonds.

Expenditures by the lessee for improvements and additions to property in 1879 were $309,124.54; total to Dec. 31, 1879, $6,770,998.42. Under the lease the lessee has received $6,461,500 in special guaranteed stock, leaving a balance of $309,498.42 still due.

The earnings and expenses, as reported by the lessee, were as follows:

	1879.	1878.	Inc. or Dec.	P. c.
Passengers	$1,922,806.98	$1,780,842.66	I. $141,964.32	8.0
Freight	6,066,593.55	5,600,457.64	I. 466,135.91	8.3
Mail and express	269,797.61	287,074.26	D. 17,276.65	6.0
Rents, etc	163,184.76	161,735.09	I. 31,449.67	19.4
Total	$8,452,382.90	$7,830,109.65	I. $622,273.25	7.9
Expenses	4,501,128.80	4,140,912.67	I. 360,216.13	8.7
Net earns	$3,951,254.10	$3,689,196.98	I. $262,057.12	7.1
Gross earns. per mile	18,045.61	16,717.07	I. 1,329.54	7.9
Net earns. per mile	8,435.82	7,876.34	I. 559.48	7.1
Per cent. of exps	53.25	52.88	I. 0.37	0.7

The report deals only with the financial affairs of the company, and no statements of traffic are given. The result to the lessee is stated as follows:

Net earnings, as above		$3,951,254.10
Net gain from Lawrence and New Castle & Beaver Valley roads		9,180.43
Total		$3,960,434.53
Amount allowed Cleveland & Pittsburgh on division of joint earnings		231,136.28
Net balance		$2,729,298.25
Dividends paid	$1,853,070	
Interest paid	955,700	
Organization and transfer agencies	19,000	
		2,828,670.00
Net profit to lessee		$900,628.25

The net profit for 1878 was $826,962. From this is to be deducted both years $104,100 to sinking fund (of which the lessee finally receives the benefit), leaving an actual cash profit of $796,528.25 for the year. All payments required by the lease have been punctually made.

The report of the Consulting Engineer of the company, which is appended to the President's report, states that while there has been no addition to the number of either engines or cars during the past year, 14 of the old light engines have been replaced with heavier ones, and four of those which are known as the standard engines of the road have been sold and still heavier ones built to take their place. The general condition of the freight equipment is fair, and the engine houses and machine shops are generally in good condition. The Eastern Division is laid entirely with steel rails, and 79 miles of it ballasted with stone or cinder. The Engineer says: "The tonnage of the road has increased to such an extent, and must continue to increase as the western country becomes more fully developed, that the question of second track cannot longer be delayed if your road is to handle its proper share of the east and west bound traffic. Some additional second track should be laid in this division the present year, and each year thereafter, until this division is double-tracked, when, if not sooner, that in the Western Division must follow."

On the Western Division, 3,600 tons of steel rails were laid during last year, leaving only 21 miles of the road now in iron. At the close of the year, 94 miles of this division had stone or cinder ballast. The report continues: "Additional sidings were laid at Robinson, Nevada, Forest, Delphos, Middlepoint, Van Wert, Dixon, Monroeville, Maples, Ft. Wayne, Hadley, Arcola, Columbia, Warsaw, Selby, Plymouth, Hamlet, Hanna, Winslow, Valparaiso and Wheeler. Most of these have been placed in reference to becoming second track, and to that extent are expenditures in that direction. The additional property purchased at Ft. Wayne in 1872 is being made a freight yard, two miles of sidings having been laid on it the last year. This relieves that station, track facilities at that point not being adequate for the large local business of the place and the passing of trains. Additional land at Chicago has been purchased for a new freight-yard, in the southern part of the city, and will be improved this year. This will add largely to the facilities in handling the business concentrating at that point. One iron bridge has been substituted for a wooden one, and the viaduct erected over Eighteenth street, Chicago, jointly with the Chicago & Alton, is completed. The additions to property on track account are $139,993.13 in all."

The station buildings are in fair order, but only one new one was built last year. Property has been bought for a suitable passenger house in Chicago.

East Tennessee, Virginia & Georgia.

This company owns a road from Bristol, on the line between Virginia and Tennessee to Chattanooga, 242 miles, with a branch from Cleveland, Tenn., to Dalton, Ga., 28 miles, making 270 miles in all. It also owns the Cincinnati, Cumberland Gap & Charleston road, from Morristown to Wolf Creek, 40 miles, and it leases the Memphis & Charleston from Stevenson to Memphis, 272 miles, but the earnings of those lines are reported separately. The report is for the year ending June 30, 1879.

The equipment consists of 38 engines: 2 sleeping, 25 passenger, 10 mail and baggage cars; 366 box and stock, 205 coal and flat and 13 caboose cars; 1 pay, 2 derrick and 117 hand and dump cars.

The general account is as follows:

Stock ($7,285 per mile)		$1,967,074.00
Bonds ($15,504 per mile)		4,186,000.00
Bills, accounts and balances		439,314.50
Profit and loss		3,465,691.85
Total		$10,058,080.35
Cost of road ($34,020 per mile)	$9,185,632.79	
Cin., Cum. Gap & Charleston R. R.	227,125.92	
Stocks, bonds, etc	325,816.92	
Cash, materials and receivables	319,504.72	
		10,058,080.35

The funded debt consists of $873,000 sectional bonds; $3,123,000 first-mortgage 7 per cent. bonds, and $190,000 second-mortgage 4 per cent. bonds.

The earnings for the year were as follows:

	1878-79.	1877-78.	Inc. or Dec.	P. c.
Passage	$270,438.26	$305,552.20	D. $35,113.94	11.5
Freight	650,687.58	648,293.93	I. 2,393.65	0.4
Express and mail	60,456.96	63,621.55	D. 3,164.59	5.0
Miscellaneous	22,740.22	20,814.03	I. 1,926.19	7.3
Total	$1,004,323.02	$1,038,281.71	D. $33,958.69	3.3
Expenses	620,103.87	612,643.13	I. 7,460.74	1.2
Net earn	$384,219.15	425,638.58	D. $41,419.43	9.7
Gross earn. per mile	3,719.71	3,845.49	D. 125.78	3.3
Net earn. per mile	1,423.03	1,576.44	D. 153.41	9.7
Per cent. of exps	61.74	59.00	I. 1.74	3.0

The passenger traffic decreased largely. Freight traffic increased, but the earnings remained stationary, on account of low rates prevailing a great part of the year.

The income account was as follows:

Net earnings, as above	$384,219.15
Interest, etc	1,008.53
Total	$385,227.68
Interest and exchange	$280,459.68
Dividend, 3 per cent	58,872.00
Right of way, etc	3,925.00
	343,256.68
Balance to profit and loss	$41,971.00

The expenses include all renewals and betterments, which last year amounted to $144,814.22. This included new steel rails, stone-ballast, new bridge-work, new locomotives and cars. There have been 4,000 tons of steel rails laid since the report was made.

The traffic for the year was as follows:

Train mileage:	1880.	1879.	Inc. or Dec.	P. c.
Passenger	309,977	394,191	D. 84,214	21.4
Freight	497,747	517,708	D. 19,961	3.8
Service and switching	97,561	93,596	I. 3,965	4.2
Total	905,285	1,005,495	D. 100,210	10.0
Cost of motive power per mile	17.17 cts.	17.97 cts.	D. 0.80 ct.	4.4
Earnings per train mile	121.52 "	111.58 "	I. 9.94 "	8.9
Net " " "	44.78 "	44.41 "	I. 0.37 "	0.8
Freight car mileage	6,947,305	.....	.....	....
Bales cotton carried	201,170	195,360	I. 5,810	3.0
Tons freight carried	273,482	239,054	I. 34,428	14.4
Rate per ton per mile	1.54 cts.	1.71 cts.	D. 0.17 ct.	10.0

Of the car mileage 23.6 per cent. was of empty cars. The average rate per mile on through freight east from Chattanooga was 0.70 cent; from Dalton, 0.90 cent; west to Chattanooga, 1.22 cents; to Dalton, 1.30 cents. Passenger trains earned 106.74 cents, and freight trains 130.73 cents per mile. Local tonnage was about 58 per cent. of the whole.

During the year 373 tons rerolled iron and 1,963 tons new steel rails were laid; 80,930 new ties were put down, and much work done in lengthening old sidings and building new ones. There were 32 new freight and 11 road cars built at the shops. Two heavy Mogul freight engines were bought for use on the Eastern Division, where the heaviest grades are. These engines have worked very well, hauling increased loads at much less cost for train-service, and it is intended to buy several more of them to replace old engines worn out. Several engines have been rebuilt during the year.

It became necessary to advance $70,081.90 to the Memphis & Charleston Company, to avoid a default in interest. The lease of that road has been amended, taking away from the lessor the power to terminate the lease, the lessee in return agreeing to make good deficiencies. All coupons paid by the lessee are to be held as a subsisting lien against the leased road. The lessee also intends to make some advances to put the road in good condition in shorter time than could be done from the net earnings of the line itself. It is believed that this will be good policy and will reduce expenses.

Only 3 per cent. dividends were paid for the year, the balance being used to pay off floating debt. The sum of $41,971 from earnings was applied to this purpose, and also the proceeds of $35,000 Western North Carolina bonds sold. The company still holds $194,000 of these bonds.

The general condition of the property is very much better than ever before. It is intended to continue the work of relaying the main line with steel, and putting down stone ballast.

The road was worked during the year without serious accident, and trains were run with great regularity.